

QH
323
.C6
A4X
6th 1918
INVZ

Sixth Report of the Laguna Marine Laboratory

**and Contributions from the
Zoological Laboratory of
Pomona College**

SIXTH REPORT OF
THE LAGUNA MARINE
LABORATORY AND CON-
TRIBUTIONS FROM THE
ZOOLOGICAL LABORA-
TORY OF POMONA
COLLEGE

PUBLISHED BY POMONA COLLEGE

1918



INDEX

- I. LIST OF SPIDERS FROM THE CLAREMONT-LAGUNA REGION.
II. TENTATIVE LIST OF HEMIPTERA FROM THE CLAREMONT-LAGUNA REGION.....*Charlotte Johnson, Ruth Ledig*
III. THE CENTRAL NERVOUS SYSTEM OF A CUMACEAN.....*William A. Hilton*
IV. LAND MOLLUSCS NEAR CLAREMONT.....*Ivan Johnson*
V. MOLLUSCOIDA AT LAGUNA BEACH.
VI. PRELIMINARY LIST OF BUTTERFLIES FROM THE CLAREMONT-LAGUNA REGION.
VII. A TENTATIVE LIST OF MOTHS FROM THE CLAREMONT-LAGUNA REGION.
VIII. SUGGESTIONS FROM THE STUDY OF THE CENTRAL NERVOUS SYSTEM OF INVERTEBRATES.....*W. A. Hilton*
IX. THE NERVOUS SYSTEM OF THYSANURA.....*W. A. Hilton*
X. EARLY SPECIMENS OF HYMENOPTERA FROM THE CLAREMONT-LAGUNA REGION.....*Charlotte Johnson and Ruth Ledig*
XI. COLEOPTERA FROM THE CLAREMONT-LAGUNA REGION.....*Lea Myers*
XII. CLAREMONT-LAGUNA DIPTERA.....*Walter Sturgis*
XIII. ISOPODS FROM THE CLAREMONT-LAGUNA REGION.
XIV. A LIST OF SOME ADDITIONAL SHRIMP-LIFE CRUSTACEA FROM LAGUNA BEACH.....*W. A. Hilton*
XV. SOME AMPHIPODS COLLECTED DURING THE SUMMER OF 1916 AT LAGUNA BEACH.....*M. Sharz*
XVI. CRABS TAKEN AT LAGUNA BEACH IN THE SUMMER OF 1916.....*H. H. Nininger*
XVII. CONNECTIONS BETWEEN NUCLEUS AND CYTOPLASM.....*W. A. Hilton*
XVIII. CENTRAL GANGLIA OF SOME DECAPOD CRUSTACEA.....*W. A. Hilton*
XIX. NOTES ON THE CENTRAL NERVOUS SYSTEMS OF HOLOTHURIANS.....*W. A. Hilton*
XX. COELENTERATES FROM LAGUNA BEACH.....*H. H. Nininger, A. M. Bean*
XXI. NOTES ON ANNELIDS COLLECTED DURING 1917 AT LAGUNA BEACH.
XXII. SOME CHITONS COLLECTED DURING THE SUMMER OF 1917.
XXIII. A CUMACEAN FROM LAGUNA BEACH.....*H. H. Nininger*
XXIV. A PARASITIC COPEPOD FOUND AT LAGUNA BEACH.....*A. M. Bean, Harry Staples*
XXV. NOTES ON THE CENTRAL NERVOUS SYSTEM OF HOLOTHURIANS.....*W. A. Hilton*
XXVI. NOTES ON FLAT WORMS AT LAGUNA BEACH.....*W. L. Groze, D. L. Darsie*
XXVII. BRANCHIOSTOMA CALIFORNIENSE GILL.
XXVIII. FURTHER OBSERVATIONS ON THE MOUNTAIN SHEEP OF THE SAN GABRIEL RANGE.....*W. A. Hilton*
XXIX. SCORPIONS FROM THE CLAREMONT-LAGUNA REGION.
XXX. BLEPHARIPODA OCCIDENTALIS.....*J. Caldwell*
XXXI. SEROLIS CARINATA.....*Harry Staples*
XXXII. NOTES ON SPONGES AT LAGUNA BEACH.....*W. L. Groze*
XXXIII. THE CENTRAL NERVOUS SYSTEM OF A LONG-ARMED SERPENT STAR.....*W. A. Hilton*
XXXIV. DOLICHOGLOSSUS PUSILLUS.
XXXV. PYCNOGONIDS COLLECTED DURING THE SUMMER OF 1917 AT LAGUNA BEACH.....*W. A. Hilton*
XXXVI. SOME ECHINODERMS OF LAGUNA BEACH.
XXXVII. A LIST OF ODONATA CHIEFLY FROM LAGUNA BEACH.....*D. L. Darsie*
XXXVIII. A LIST OF SMALL MAMMALS FROM THE CLAREMONT-LAGUNA REGION.....*H. C. White*

List of Spiders from the Claremont-Laguna Region

Many local specimens have not yet been determined. We have no determined specimens of those enclosed in brackets, although there are published records of these species from our general region.

AVICULARIID.Æ

Bothriocyrtum californicum Camb. *Eurypelma californicum* Auss.

FILISTATID.Æ

(*Filistata hibernalis* Hentz. Banks. Davidson, Los Angeles.)

DRASSID.Æ

(*Drassinella modesta* Banks. Banks. Baker, Catalina I. *Megamyrmeleon californicum* Simcn. Banks. Baker. *Gnaphosa californica* Banks. Banks. Baker. *Zelotes femoralis* Banks. Banks. Baker. *Z. maculata* Banks. Banks. Baker. *Herpyllus angustus* Banks. Banks. Cockerell, San Pedro. *H. validus* Banks. Banks. Baker.) *Sergiolus bicolor* Banks. Ledig. Ledig.

PHOLCID.Æ

Pholcus phalangioides Fues. Ledig. Ledig.

SCYTODID.Æ

(*Diguetia canites* McCook. Banks. Davidson, Los Angeles.)

CLUBIONID.Æ

(*Chiracanthium inclusa* Hentz. Banks. Baker. *Castaneria crocata* Hentz. Banks. Baker. *Trachelas tranquilla* Hentz. *T. californica* Banks. *Trachelas Sp. Gayenna celer* Hentz. Ledig. Ledig.)

AGALENID.Æ

(*Agalina pacifica* Banks. Banks. Baker. Catalina I. *A. californica* Banks.) (*Cybaeus minor* Banks. Banks. Baker.)

DICTYNID.Æ

(*Dictyna sublata* Hentz. Baker. *Dytyna calcarata* Banks. Cockerell, San Pedro. *D. Volucripes* Keys. Baker.)

THERIDIID.Æ

(*Theridium tepidarium* Koch. Davidson, Los Angeles.) *Laterodectus mactans*. Koch. (*Diopenia pictipes* Bank. Banks. Baker.) (*Europis californica* Banks. Banks. Baker. *Steatoda grandis* Banks. Baker.)

LINYPHIID.Æ

(*Bathypantes pallidula* Bank. Banks. Baker. *Lophocrenum fasciatum* Banks. Baker. *Erigone californica* Banks. Banks. Baker.)

MIMETID.Æ

(*Mimetus intersector* Hentz. Banks. Baker.)

ARGIOPID.Æ

(*Aranca angulata* Clark. Davidson, Los Angeles.) *A. gemma* McCook. (*A. pacifica* McCook. Banks. Baker. *A. oacensis* Keys. Davidson, Los Angeles. *A. conchlea* McCook. Banks. Baker. *Zilla californica* Banks. Banks. Cockerell, San Pedro. *Cyclosa conica* Pallas. Banks. Hutchinson, Los Angeles.) *Agriope argentata* Fab. Moles. Moles. (*A. trifaciata* Forak. Hutchinson, Los Angeles. *Leucauge hortorum* Hentz. Banks. Hutch). *Meta menardi* Lat.? Ledig. Ledig. *Gasteracantha maura* McCook. Moles.

TETRAGNATHID.Æ

Tetragnatha laboriosa Hentz. Moles. Moles.

THOMISIDÆ

- (*Xysticus californicus* Keys. Davidson, Los Angeles.) *X. gluosus* Keys. Moles. *X. triguttatus* Keys. Chamberlin. Moles.
 (*Runcinia californica* Banks. Banks. Baker.) *Misumena californica* Banks. Banks. Davidson, Los Angeles. *M. alcatoria* Hentz. Chamberlin. Moles.
 (*Thanatus triguttatus* Keys. Banks. Baker.) *Misumessus asperatus* Hentz. Chamberlin. Moles. *Philodromus pernix* Black. Chamberlin. Moles. *Tibellus duttonii* Hentz. Chamberlin. Moles.

SPARASSIDÆ

- (*Olios fasciculatus* Simon. Banks. Davidson.) *O. abnormis* Keys. Ledig. Ledig.

PISAURIDÆ

- Dolomedes* sp.?

LYCOSIDÆ

- (*Lycosa pacifica* Banks. Banks. Baker. *L. brunneiventris* Banks. Banks. Baker.)
L. cinerea Chamb. Corwin. Corwin. *L. carolinensis* Walck. Johns. *Pardosa* sp.
Sossippus californicus Simon. Banks. Baker.) *Pirata* sp. Corwin.

OXYOPIDÆ

- Peucetia viridans* Hentz. Moles. Moles.

ATTIDÆ

- (*Phidippus johnsoni* Peck. Banks. Banks. Baker. *P. orpifex* McCook. Banks. Davidson, Los Angeles. *P. bicolor* Keys. Banks. Baker. *P. sp.?*) *Marpissa californica* Peck. Johns. Johns. *Dendryphantes vitis* Cock. Banks. Banks. Baker. *D. harfordi* Peck. Banks. Baker. *Thiodina retarius* Hentz. Banks. Baker. *Pellenes signatus* Banks. Banks. Davidson, Los Angeles. *P. elegans* Peck. Banks. Cockerell, San Pedro. *P. tarsalis* Banks. Banks. Cockerell, San Pedro. *Pelienes speciosa* Banks. Banks. Baker. *Metacryba similis* Banks. Banks. Hutch., Los Angeles. *M. teniola* Hentz. Banks. Baker.

(Contribution from the Zoological Department of Pomona College)

Tentative List of Hemiptera from the Claremont-Laguna Region

CHARLOTTE JOHNSON, RUTH LEDIG

This list has been compiled from the departmental collections of Pomona College. At this time no attempt has been made to change the determinations of the first specimens to keep pace with recent changes in terminology. Only the first record of the collection of a species is given at this time.

SCUTELLERIDÆ

- Sphyracoris punctellus* Stal. V.D. Baker. Claremont, Cal.
Eurygaster alternatus Say. —. Baker. Mountains near Claremont, Cal.
Eurygaster shoshone Kirk. V.D. Baker. Claremont, Cal.
Homæmus proteus Stal. V.D. Baker. Mountains near Claremont, Cal.
Homæmus grammicus Wolff. V.D. Baker. Mountains near Claremont, Cal.
Homæmus bijugis Uhl. V.D. Baker. Mountains near Claremont, Cal.
Stethaulax marmoratus Say. V.D. Baker. Claremont, Cal.

CYDNIDÆ

- Pangærus margo* Stal. Uhl. Baker. Claremont, Cal.
Geotomus parvulus Uhl. V.D. Baker. Mountains near Claremont, Cal.

(PLATASPIDÆ)

- Corimelena lateralis* Fab. V.D. Baker. Claremont, Cal.

PENTATOMIDÆ

- Brochymena pusticlata* Fab. V.D. Baker. Claremont, Cal.
Peribalus limbularius Stal. V.D. Baker. Claremont, Cal.
Banasa dimidiata Say. O.H. Baker. Mountains near Claremont, Cal.
Thyfanta perditor Fab. O.H. Baker. Claremont, Cal.
Murgantia histrionica Hunn. —. Baker. Laguna Beach, Cal.
Nezara hillebrisi Say. V.D. Baker. Claremont, Cal.
Euschistus conspersus Uhl. V.D. Baker. Mountains near Claremont, Cal.
Euschistus impictiventris Stal. Uhl. Baker. Mountains near Claremont, Cal.

(ASOPIDÆ)

- Perillus splendidus* Uhl. V.D. Baker. Claremont, Cal.
Zicrona cerulea L. O.H. —. Mountains near Claremont, Cal.
Zicrona cuprea Dall. O.H. Baker.

COREIDÆ

- Ficaria apicalis* Dall. V.D. —. Claremont, Cal.
Chelinidea vittiger Uhl. —. Baker. Claremont, Cal.
Margus inconspicuus H.S. O.H. Baker. Claremont, Cal.
Gatorhintha texana Stal. Uhl. Baker. Claremont, Cal.
Anasa tristis Deg. —. —. Claremont, Cal.

(CORIZIDÆ)

- Harmostes reflexulus* Say. Uhl. Baker. Mountains near Claremont, Cal.
Aufesius impressicollis Stahl. V.D. Baker. Claremont, Cal.
Liorhyssus hyalinus Fab. —. Baker. Claremont, Cal.
Arhyssus punctiventris Dall. —. Baker. Claremont, Cal.
Corizus scutatus Stal. V.D. Baker. Claremont, Cal.
Corizus indentatus Hambl. V.D. Baker. Mountains near Claremont, Cal.
Corizus hyalinus Fabr. V.D. Baker. Claremont, Cal.
Corizus lateralis Say. V.D. Baker. Claremont, Cal.
Corizus lateralis roseus Baker. V.D. Baker. Claremont, Cal.
Corizus viridicatus Uhl. V.D. Baker. Claremont, Cal.
Corizus robustus Uhl. Uhl. Baker. Claremont, Cal.
Screntha trivittatus Say. —. Baker. Mountains near Claremont, Cal.

Niesthrea lateralis roseus Baker. —. Baker. Claremont, Cal.
Niesthrea side Fab. scutatus Stal. Fab. Baker. Claremont, Cal.
Niesthrea side Fab. validus Uhl. Fab. Baker. Claremont, Cal.

(ALYDIDÆ)

Tollius curtulus Stal. O.H. Baker. Claremont, Cal.
Alydus pluto Uhl. V.D. Baker. Claremont, Cal.
Alydus setosus Van D. V.D. Baker. Claremont, Cal.
Alydus curtulus Stal. V.D. Baker. Claremont, Cal.
Stachiochnemus apicalis Dall. V.D. Baker. Claremont, Cal.

(MEROCORIDÆ)

Corynochoris distinctus Mayo. O.H. Baker. Claremont, Cal.

(ANISOSCELIDÆ)

Narnia inornata Dist. Uhl. Baker. Claremont, Cal.
Loptoglossus occidentalis Neid. V. D. —. Claremont, Cal.

ARADIDÆ

Aradus lineatus Say. —. Baker. Mountains near Claremont, Cal.
Aradus n. sp. —. —. Baker. Claremont, Cal.
Aradus fallini Stal. V.D. Baker. Claremont, Cal.

NEIDIDÆ

Jalysus spinosus San. O.H. Baker. Mountains near Claremont, Cal.
Neides muticus Say. V.D. Baker. Mountains near Claremont, Cal.

LYGÆIDÆ

Lygacus melanocrocyphos Say. V.D. Baker. Claremont, Cal.
Lygacus pyrrhopterus Stal. V.D. Baker. Claremont, Cal.
Lygacus bicrucis Say. Uhl. Baker. Claremont, Cal.
Oncopeltus fasciatus Dall. —. Baker. Claremont, Cal.

(CYMIDÆ)

Arphuus coriaccipennis Stal. Uhl. Baker. Mountains near Claremont, Cal.
Ischnorhynchus francissanus Stal. V.D. Baker. Claremont, Cal.
Gymus luridus Stal. V.D. —. Laguna Beach, Cal.

(GEOCORIDÆ)

Geocoris pallens decoratus Uhl. V.D. Baker. Claremont, Cal.
Geocoris decoratus solutus Mont. Mont. Baker. Mountains near Claremont, Cal.
Geocoris uliginosus Say. limbatus Stal. Mont. Baker. Claremont, Cal.

(MYODOCHIDÆ)

Emblethis vicarius Horv. V.D. —. Claremont, Cal.
Scolopostethus tropidalis Dist. V.D. Baker. Claremont, Cal.

(PACHYGRONTHIDÆ)

Peliopelta abbreviata Say. —. Baker. Mountains near Claremont, Cal.

(HETEROGASTRIDÆ)

Heterogaster behrensi Uhl. V.D. Baker. Claremont, Cal.

(MYODOCHIDÆ)

Ozophora picturata Stal. —. Baker. Mountains near Claremont, Cal.
Rhyparochromus sodalicus Uhl. V.D. Baker. Mountains near Claremont, Cal.

(ORSILLIDÆ)

Nysius californicus Stal. V.D. Johnson. Pine Lake, So. Cal. Mountains near Claremont, Cal.

Nysius senecionis Schill—*strigosus* Uhl. —. Baker. Mountains near Claremont, Cal.

Nysius Angustatus—*minutus* Uhl. —. Baker. Mountains near Claremont, Cal.

Ortholomis cookii Baker. —. Baker. Mountains near Claremont, Cal.

Ortholomis arphnoides Baker. —. Baker. Mountains near Claremont, Cal.

Ortholomis longiceps Stal. —. Baker. Mountains near Claremont, Cal.

Ortholomis laugiceps Stal. V.D. Baker. Claremont, Cal.

Ortholomis arphnoides Baker. V.D. Baker. Claremont, Cal.

PYRRHOCORIDÆ

Largus convivus Dist. Uhl. Baker. Claremont, Cal.

TINGIDIDÆ

Teleonemia nigrina Uhl. O.H. Baker. Claremont, Cal.

Corythucha setosa Champ. O.H. Baker. Claremont, Cal.

Piesma cinera Say. Uhl. Baker. Mountains near Claremont, Cal.

Corythucha —. V.D. Baker. Mountains near Claremont, Cal.

Corythucha sordidula Uhl. Ms. Uhl. Baker. Mountains near Claremont, Cal.

Corythucha setosa —. —. Baker. Mountains near Claremont, Cal.

Corythucha catala —. O.H. Baker. Nor. Uhl. Claremont, Cal.

REDUVIIDÆ

(HARPACTORIDÆ)

Zelus incarnatus Bergs. —. Baker. Claremont, Cal.

Sinea complexa Caud. O.H. Baker. Claremont, Cal., and mountains near.

Sinea diadema undulata Uhl. V.D. Baker. Claremont, Cal.

Sinea diadema Fabr. V.D. Baker. Claremont, Cal., and mountains near.

Zelus (Diptodus) *socius* Uhl. O.H. Baker. Claremont, Cal.

Zelus raptoria Stal. Uhl. Baker. Mountains near Claremont, Cal.

Pseliopus spinicollis Champ. V.D. Baker. Mountains near Claremont, Cal.

Rhyncoris ventralis Say. V.D. Baker. Claremont, Cal.

Darbanus georgias Prov. —. Baker. Claremont, Cal.

Zelus cervicalis Stal. Uhl. Baker. Mountains near Claremont, Cal.

(ACANTHASPIDÆ)

Conorhinus productus Uhl. —. Baker. Claremont, Cal.

Conorhinus protractus Uhl. Uhl. Baker. Claremont, Cal.

(PIRATIDÆ)

Rasahus biglutatus Say. Uhl. Baker. Mountains near Claremont, Cal.

Rasahus thoracicus Stal. V.D. Baker. Laguna Beach, Cal.

PHYMATIDÆ

Phymata erosa L. —. n. var. Baker. Mountains near Claremont, Cal.

Phymata acutanaua Quer. —. Baker. Mountains near Claremont, Cal.

(ENESIDÆ)

Ploiaria californica Baker. —. Baker. Claremont, Cal.

Barce banksii Baker. —. Baker. Mountains near Claremont, Cal.

Emesa brevicoxa Bks. —. Baker. Claremont, Cal.

Ploiariodes tessellata Baker. —. Baker, Metz. Claremont, Cal.

HEBRIDÆ

Hebrus ornatus Uhl. Uhl. Baker. Claremont, Cal.

NABIDÆ

Nabis (ferus) Linn. V.D. Baker. Claremont, Cal., and mountains near.

MIRIDÆ

Lopidea indentata Uhl. Uhl. Baker. Claremont, Cal.

Lopidea nigridea Uhl. V.D. Baker. Claremont, Cal.

Closterocoris ornatus Uhl. Uhl. Baker. Claremont, Cal.

Closterocoris amarus Prov. V.D. Baker. Claremont, Cal.

Irbisia sericans Stal. V.D. Baker. Claremont, Cal.

Irbisia politus Uhl. Am.R. Baker. Claremont, Cal.

Pacilocapsus nigriger Stal. V.D. —. Claremont, Cal.

Pacilocapsus lineatus Fab. Uhl. Baker. Claremont, Cal.

Paciloscythus elegans Reut. Om.R. Baker. Mountains near Claremont, Cal.

Paciloscythus uhleri Van D. V.D. Baker. Mountains near Claremont, Cal.

Systratiotus brunneosus Uhl. Uhl. Baker. Mountains near Claremont, Cal.

Trachycoris socius Uhl. Uhl. Baker. Mountains near Claremont, Cal.

Irbisia brachycerus Uhl. V.D. Baker. Claremont, Cal.

Lygus rubicundus Fall. Om.R. Baker. Mountains near Claremont, Cal.

Lygus Bakeri Reut. Om.R. Baker. Mountains near Claremont, Cal.

- Lygus Pratensis* Linn. O.H. Baker. Claremont, Cal.
Phytocoris roseus Uhl. Om.R. Baker. Claremont, Cal.
Phytocoris cunescens Reut. Om.R. Baker. Claremont, Cal.
Phytocoris ruforniptus Van D. V.D. Baker. Claremont, Cal.
Phytocoris Bakeri Reut. Om.R. Baker. Claremont, Cal.
Phytocoris sp. —. V.D. Baker. Claremont, Cal.
Eugytatus simplex n. sp. —. Reut. Baker. Mountains near Claremont, Cal.
Diaphnidia pellucida Uhl. O.H. and Om.R. Baker. Claremont, Cal.
Hycidea picta Uhl. V.D. Baker. Claremont, Cal.
Arthatus chloronis Say. V.D. Baker. Claremont, Cal.
Diaphnida hamata Van D. V.D. Baker. Claremont, Cal.
Tiryas elongatus Uhl. V.D. Baker. Claremont, Cal.
Plagiognathus moerens Reut. V.D. Baker. Claremont, Cal.
Plagiognatharia atomoscelis seriatus Reut. O.H. and Om.R. Baker. Claremont, Cal.
P. europiella umbrina Reut. Om.R. n. sp. Baker. Claremont, Cal.
P. macrotylus moebens Uhl. —. Baker. Claremont, Cal.
P. psallus sp. —. V.D. Baker. Claremont, Cal.
P. rhinacloa forticornis Reut. Om.R. Baker. Claremont, Cal.
Oncotylaria hoplomachus consors Uhl. Om.R. Baker. Claremont, Cal.
Cyllocoraria orthotylus planatus Uhl. Om.R. Baker. Mountains near Claremont, Cal.
Pilophoraria pamilla Behrensii Uhl. Uhl. Baker. Claremont, Cal.
Dicypharia californicus Stahl. Om.R. Baker.
Dicyphus vestitus Uhl. V.D. —. Laguna, Cal.
Haboparia hadronema robusta Uhl. Om.R. Baker. Elsinore, Cal.
Haboparia hyoidea grisea Reut. Om.R. Baker. Claremont, Cal.
Haplomachidea consors Uhl. Om.R. Baker. Claremont, Cal.
Campbrochis schwartz Uhl. V.D. Baker. Claremont, Cal.
Creontiades femoralis V.D. V.D. —. Laguna, Cal.
Orthotulus planatus Uhl. Om.R. Baker.

GERRIDÆ

- Hygrotrechus productus* Uhl. Det.Uhl. Baker. Claremont, Cal.
Hygrotrechus remigis Say. Uhl. Baker. Mountains near Claremont, Cal.
Hygrotrechus robustus Uhl. Uhl. Var.Baker. Mountains near Claremont, Cal.
Gerris canaliculatus Say. —. R.M. Mountains near Claremont, Cal.

VELIIDÆ

- Macrovelia abliger* Uhl.M. Uhl. Baker. Mountains near Claremont, Cal.
Microvelia americana Uhl. Det.Uhl. Baker. Claremont, Cal.

(ACANTHIADÆ) SALDIDÆ

- Salda pallipes* Fab. Uhl. Baker. Elsinore, Cal.
Saldula interstitialis Fab. V.D. —. Laguna, Cal.

NOTONECTIDÆ

- Notonecta americana* —. Buene. Baker. Claremont, Cal.
Notonecta indica Linn. V.D. —. Claremont, Cal.
Notonecta insulata Kay. O.H. Baker. Claremont, Cal. Mountains near Claremont, Cal.
Notonecta mexicana A&S. —. Baker. [Fieb. V.ceres] Claremont, Cal., and mountains near.
Anisops pallidus Champ. Var. Uhl. Baker. Claremont, Cal.

BELOSTOMATIDÆ

- Scaphus dilatatus* —. —. Baker. Mountains near Claremont, Cal.
Abedus delatatus Say. V.D. —. Laguna, Cal.
Zaitha elliptica Lat. Uhl. Baker. Claremont, Cal.
Belostoma apache Kirk. V.D. —. Laguna Beach, Cal.

NAUCORIDÆ

- Ambrysus signoreti* Stal. Uhl. Baker. Claremont, Cal.

ANTHOCORIDÆ

Triphleps insidiosus Say. Uhl. Var. Baker. Claremont, Cla. Mountains near Claremont, Cal.

Anthocoris marginatus Uhl. Uhl. Baker. Mountains near Claremont.

Anthocoris antevolens B.White. Uhl. —. Claremont, Cal.

CORIXIDÆ

(*Corsa cubæ*)—*Callicorixa Kollarii* Fieb. —. Baker. Mountains near Claremont, Cal.

Corixa sp. —. Baker. Claremont, Cal.

Corixa alternata Say. Uhl. Baker. Claremont, Cal.

Corixa mercenaria Say. Uhl. Baker. Elsinore, Cal.

CICADIDÆ

Platyptedia minsi Uhl. —. Baker. Claremont, Cal.

Okanagana blaisdelli Uhler. —. Baker. Mountains near Claremont, Cal.

Okanagana rinosa sq. Say. Var. Baker. Mountains near Claremont, Cal.

Tibicen blaisdelli Uhl. —. Baker. Claremont, Cal.

Tibicen cupres-sparsa Uhl. —. Baker. Claremont, Cal.

Tibicen rinosa Say. —. Baker. Claremont, Cal.

CERCOPIDÆ

Clastopterine clastoptera linneaticollis Stal. —. Baker. Mountains near Claremont, Cal.

Clastopterine clastoptera obtusa Say. —. Baker. Claremont, Cal.

Clastopterine clastoptera binotata Ball. —. Baker. Mountains near Claremont, Cal.

Aphrophora sp. —. Baker. Claremont, Cal.

MEMBRACIDÆ (SIMLIDÆ)

Stictocephala inermis Fabr. Var. Baker. Mountains near Claremont, Cal.

Stictocephala Franciscana Stal. Var. Baker. Elsinore, Cal.

Stictocephala lutea Wlk. —. Baker. Claremont, Cal.

Microtalis binaria F.W.L. v.paleus. Baker. Claremont, Cal.

Microtalis binotata [Gody] Var. —. Baker. Claremont, Cal.

Ceresine albidosparsa Stal. —. Baker. Claremont, Cal.

CICADELLIDÆ (JASSIDÆ)

Paragomia 13-punctata Ball. F.H.L. Baker. Claremont, Cal.

Thamnotettix geminatus Van D. F.H.L. Baker. Claremont, Cal.

T. gloriosus Ball. F.H.L. Baker. Claremont, Cal.

T. mendicus Ball. F.H.L. Baker. Claremont, Cal.

Phelpsius spatulatus Van D. F.H.L. Baker. Mountains near Claremont, Cal.

Empocisca flavescens Fab. F.H.L. Baker. Claremont, Cal.

Dicraneura unipuncta Gill. Form. Baker. Mountains near Claremont, Cal.

Cicadula crigogonum fasciculatum

Gnathodus impictus Van D. —. Baker. Claremont, Cal.

Thamnotettix coquillettii Van D. —. Baker. Claremont, Cal.

Uhleriella coquillettii Van D. —. Baker. Claremont, Cal.

Platymstopius acutus San. —. Crawford. Mountains near Claremont, Cal.

Deltoccephalus melsheimerii Fh. —. Baker. Mountains near Claremont, Cal.

Typhlocybinae typhlocyba tricineta Fn. —. Baker. Crawford. Mountains near Claremont, Cal.

T. typhocyba obliqua. —. —. Baker. Claremont, Cal.

T. typhocyba comes n. var. —. —. Baker. Claremont, Cal.

T. typhocyba commissuralis Stal. —. Baker. Mountains near Claremont, Cal.

Empoasca alboreura Gill. Form. Baker. Claremont, Cal.

E. tessellata Fieb. —. Baker. Claremont, Cal.

E. viridescens Walsh. —. Baker. Mountains near Claremont, Cal.

E. pura Stal. —. Baker. Mountains near Claremont, Cal.

E. aureoviridis Uhl. Form. Baker. Claremont, Cal.

Dicraneura n. sp. near *abnormis*. —. —. Baker. Mountains near Claremont, Cal.

D. carneola Stal. —. Baker. Mountains near Claremont, Cal.

D. fieberi Löw. —. Baker. Claremont, Cal.

(TETTIGONIDÆ)

Tettigonia circellata Baker. —. Baker. Mountains near Claremont, Cal.

T. hieroglyphica Ball. —. Baker. Mountains near Claremont, Cal.

Draeculacephala minor Wek. —. Baker.

Oncometopia costalis Fab. —. Baker. Mountains near Claremont, Cal.

(GYPONIDÆ)

Ledra aurita L. —. Baker. Claremont, Cal.

(BYTHOSCOPIDÆ)

Idiocerus distinctus O. & B. —. Baker. Mountains near Claremont, Cal.

Idiocerus musteus Ball. —. Baker. Mountains near Claremont, Cal.

Idiocerus alternatus Fh. —. Baker. Mountains near Claremont, Cal.

Agallia cinerea O. & B. —. Baker. Mountains near Claremont, Cal.

FULGOROIDÆ

Ormenis pruinosa Say. —. Baker. Claremont, Cal.

(DELPHACIDÆ)

Liburnia consimilis Van D. —. Baker. Mountains near Claremont, Cal.

Stabaera tricarinata Sag. D.L.C. Baker. Claremont, Cal.

Kormus californica Crawf. D.L.C. Baker. Claremont, Cal.

(DICTYOPHARIDÆ)

Belonocharis fumida Uhl. —. Baker.

Scolops palidus Uhl. V.D. Baker. Mountains near Claremont, Cal.

(ISSIDÆ)

Orgernis [Tropida chidæ] *rhyparus* Stahl. —. McC. Claremont, Cal.

Peltonotellus bivittatus Ball. —. Baker. Claremont, Cal.

Naethus nigronervosus Xhelich? V.D. Baker. Claremont, Cal. Laguna.

Dyctidea [Hysteropterinae] *intermedia* Uhl. —. Baker. Claremont, Cal.

Dyctissa mutata Mel. —. Baker. Mountains near Claremont, Cal.

Neethus fenestratus Uhl. Mal. Baker. Mountains near Claremont, Cal.

Danepteryx manca Uhl. —. Baker. Mountains near Claremont, Cal.

Danepteryx lurida Mel. —. Baker. Claremont, Cal.

Issus dilatatus F. —. Baker. Mountains near Claremont, Cal.

(CIXIIDÆ)

Chlorodus —. —. Baker. Mountains near Claremont, Cal.

Chlorodus viridia Mel. n-sp. & n.g. Baker. Claremont, Cal.

Oecleus [?] —. —. Baker. Claremont, Cal.

Cixius —. —. Baker. Elsinore, Cal.

CHERMIDÆ (PSYLLIDÆ)

Paratrioza ocellata Crawf. Crawf. Baker. Claremont, Cal.

Paratrioza maculipennis Crawf. —. Baker. Claremont, Cal.

Triozaida californica Crawf. —. Baker. Mountains near Claremont, Cal.

Aphalara calthæ Linné. Crawf. Baker. Claremont, Cal.

Aphalara pulchella Crawf. —. Baker. Claremont, Cal.

Calophya californica Schw. Crawf. Metz. Claremont, Cal.

Calophya triozomina Schw. Crawf. Baker. Claremont, Cal.

Psylla Americana Crawf. —. Baker. Mountains near Claremont, Cal.

Psylla alni gossypiona Crawf. —. Baker. Mountains near Claremont, Cal.

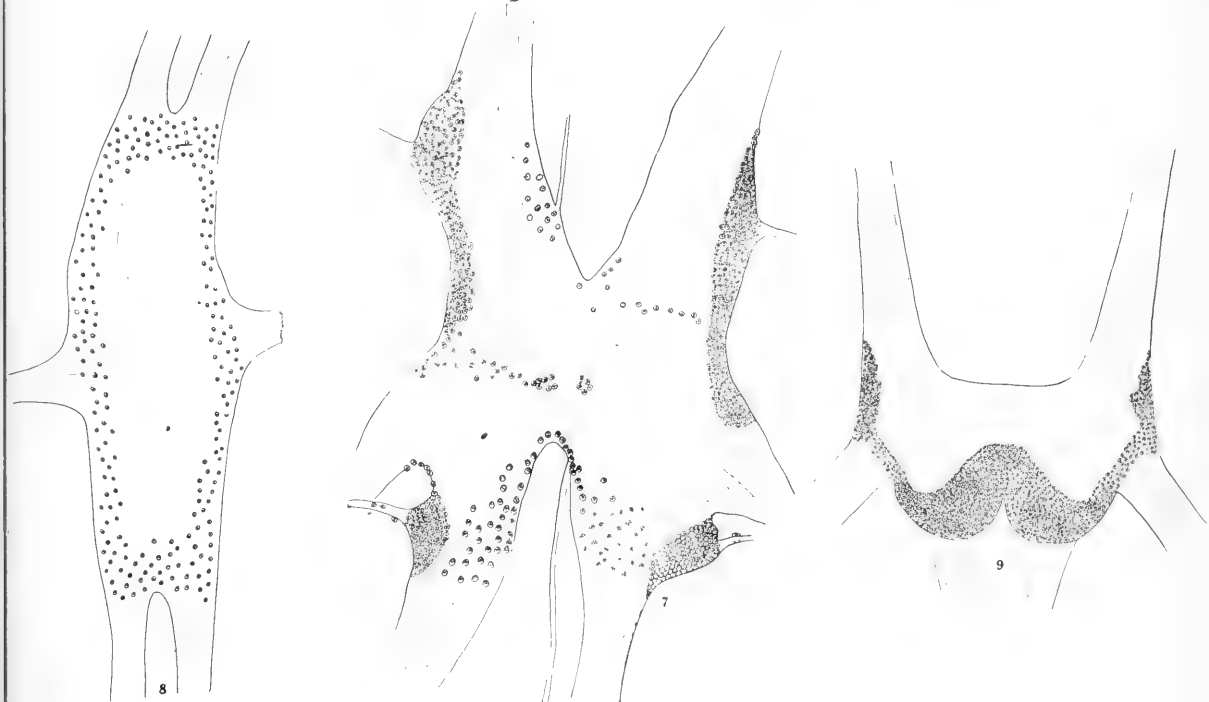
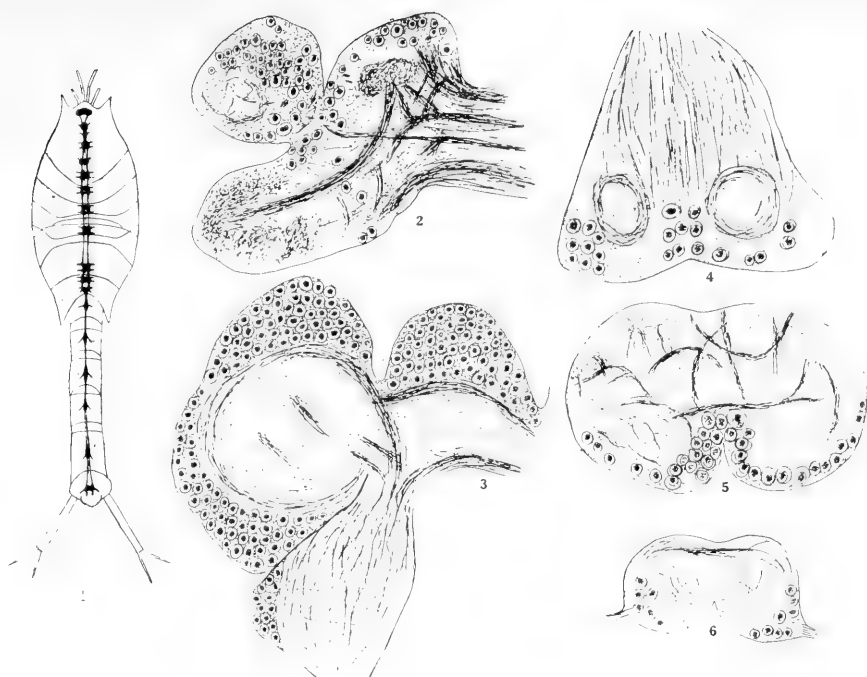
Psyllopa ceanothæ Crawf. —. Crawf. Mountains near Claremont, Cal.

Psyllopa minuta Crawf. —. Baker. Claremont, Cal.

Triozia aurantiaca Crawf. —. Baker. Laguna Beach, Cal.

Triozia albifrons Crawf. —. Baker. Mountains near Claremont, Cal.

Triozia flori Crawf. —. Baker. Laguna Beach, Cal.



- Fig. 1. Plan of the central nervous system of *Colurostylus*. X10.
 Fig. 2 and Fig. 3. Cross sections of the brain, one half shown. X150.
 Fig. 4. Cross section of the first ventral ganglion. X150.
 Fig. 5. Cross section of one of the thoracic ganglia. X150.
 Fig. 6. Cross section of one of the upper abdominal ganglia. X150.
 Fig. 7. Surface view of one of the thoracic ganglia. X150.
 Fig. 8. Surface view of an upper abdominal ganglion. X150.
 Fig. 9. Surface view of the last abdominal ganglion. X150.

Land Molluscs Near Claremont

IVAN JOHNSON

LAND FORMS

Helix aspersa Muller. The common introduced snail.

Glyptostoma newberryanum Binney. A single specimen in the Biology class collection of 1915-16.

Epiphragmophora traski sub. *zechæ* Bart. One live animal from Ice House Canyon. Altitude 6500 feet.

E. tudiculata (Binney). Apparently very common and variable.

Zonitoides arboreus (Say). Common under bark of trees along streams.

Limax flavus L. The common slug.

L. maximus L. Not so common as the last.

FRESH WATER FORMS

Planorbis trivolvis Say. Common in creeks.

Physa frontinalis acuta Drap. Abundant in reservoirs.

(Contribution from the Zoological Department of Pomona College)

Molluscoida at Laguna Beach

ENTOPROCTAN BRYOZOANS

Myosoma spinosa Robertson. These were obtained in considerable numbers from the surfaces of wavy top shells, *Astræa undosa* Wood. These shells were dredged in from ten to fifteen fathoms of water just off shore.

Barentsia gracilis Hincks. These were determined for us by Dr. Robertson. Specimens have been collected every summer for the last few years. They occur under stones at low tide. They have also been found in abundance on the under sides of the worm cases of *Sabellaria californica* and under rock ledges. In spite of their small size these little "bobbing heads" are quite evident in extensive areas.

FRESH WATER BRYOZOANS NEAR LAGUNA

During the summer of 1915 a number of specimens of fresh water bryozoans were collected on submerged leaves in the medium-sized lake, six miles inland from Laguna Beach. In the summer of 1917 no bryozoans were found in this lake, but some were found at the south end of the more northern lake and at the east end of the largest lake. Some of these were determined by Dr. Robertson as *Plumatella repens* L.

ECTOPROCTAN BRYOZOA

The following have been determined from the papers of Robertson:

NON-INCRUSTING FORMS

AETEIDÆ

Aetea anguina Linn. Found on brown algæ.

EUCRATIDÆ

Eucratea chelata Linn. Found on a dredged decorator crab.

CELLULARIDÆ

Menipea occidentalis Trask.

M.o. catalinensis Rob. From kelp holdfasts. Some on decorator crab.

Scrupocellaria californica Trask.

S. varians Hincks. Kelp holdfasts.

S. diegensis Rob. Under rocks, low tide.

BICELLARIIDÆ

Bugula neritina Linn. Common under rocks. Also on piles at Balboa Bay.

Bugula Sp. Apparently not given by Robertson.

CELLARIIDÆ

Cellaria mandibulata Hincks. Abundant along shore.

VESICULARIIDÆ

Amathia dichotoma Ver. Masses of what appeared to be this species occurred under rocks at Laguna and also on the piles at Balboa Bay. This often swarms with many small pycnogonids.

INCRUSTING BRYOZOA

MEMBRANIPORIDÆ

Membranipora tehuelcha d'Orbigny. Abundant on sea weeds, often large masses.

M. membranacea Linn. On large flat algæ.

Membranipora sp.?

STEGANOPORELLIDÆ

Thalamoporella rozieri Aud. Abundant under rock ledges.

MICROPORELLIDÆ

Microporella malusi Aud. On stems of holdfasts from deep water.

MYRIOZOIDÆ

Schizoporella hyalina Linn. Small patches on brown algæ.

S. insculpta Hincks. On twigs or stems.

S. oligopus Robert. Dredged off shore.

Myriozum sp. One or more species seemed to belong to this genus. Dredged.

ESCHARIDÆ

Lepralia bilobata Hincks? A small bit dredged off shore.

Porella concinna Busk. On mussel shell.

Retopora pacifica Rob. Dredged.

CYCLOSTOMATA

CRISIIDÆ

Crisia geniculata Milne Edw. One of the common shore forms.

C. edwardsiana d'Orbig. On a crab from deep water, 15 fathoms.

C. pacifica Rob. Small bit dredged.

TUBULIPORIDÆ

Tubulipora pulchra MacG. On broad surfaces of algæ.

Idmonca californica d'Orbig. Dredged.

Crisulipora occidentalis Rob. Very common along shore.

LICHENOPORIDÆ

Lichenopora radiata Aud. Small patches on seaweed.

THE SAND BRACHIOPOD

Glottidea albida Hinds. was first found by us, White and Hilton, at Balboa Bay. The place where they were most abundant was a little cove just off from the main bay. Here a narrow channel led to a rather deep pool. Here in the sand at the edge of the pool about a dozen specimens were found.

A RECORD OF PHORONIS

During the summer of 1917 a number of specimens of *Phoronis* were collected by White and Hilton. A study of some of these seems to show that they are *Phoronis pacifica* Torrey. This is the first record of an animal of this group so far south in California.

(Contribution from the Zoological Department of Pomona College)

Preliminary List of Butterflies From the Claremont-Laguna Region

The specimens were chiefly collected in and about Claremont by students in the past three or four years. Most of the drawings were from specimens collected by Peck. The drawings are by Miss Lucy Smith, the three photographs by L. Cooper. We have F. Grinnell to thank for suggestions as to identity and names in many cases. All are natural size.

NYMPHALIDÆ

- Anosia berenice* Bates. Male. Fig. 1.
Anosia plexippus Linn. Male. Fig. 2.
Argynnis callippe Boisd. Male. Fig. 3.
A. semiramis Edw. Female. Fig. 9.
Melitæa chalcædon Doub.-Hew. Male. Fig. 5.
M. gabbi Behr. Male. Fig. 6.
M. wrightii Edw. Male. Fig. 7.
Phyciodes mylitta Edw. Female. Fig. 10.
Junonia cania Hub. Male. Fig. 11.
Grapta satyrus Edw. (?). Male. Fig. 12.
Vanessa californica Boisd. Fig. 13.
V. antiopa Linn. Male. Fig. 14.
Pyrameis atlanta Linn. Male. Fig. 15.
P. huntera Fabr. Male. Fig. 8.
P. cardui Linn. Male. Fig. 16.
P. caryæ Hib. Male. Fig. 17.
Adelpha californica Butl. Female. Fig. 18.
Limenetis lorquini Boisd. Male. Fig. 19.
Satyrus charon Edw. (?). Female. Fig. 20.
S. sylvestris Edw. (?). Fig. 25.
Cænomorpha ceres Butl. Female. Fig. 22. White.
C. galactinus Boisd. White.
C. californica Doub.-Hew. Brownish white.

LEMONIIDÆ

Calephelis nemesis Edw. Male. Fig. 23. Many fine lines on brown wings.

Lemonias vergulti Behr.

LYCAENIDÆ

Chrysophanus helloides Boisd. Male. Fig. 21. Red-brown. Red near tip of hind wing.

Chrysophanus gorgon Boisd. Female. Fig. 26.

C. aorta Boisd. Female. Fig. 27. Brown.

Thecla halesus Cramer. Male. Fig. 28. Blue-purple. Cole. Redlands.

T. iroides Boisd. Female. Fig. 31. Dark brown.

T. spinetorum Boisd. Red-brown.

T. sæpium Boisd. Red-brown.

T. melinus. Hub. Fig. 30.

Thecla irroides Boisd. Female. Fig. 31. Dark brown.

Lycæna polyphemus Boisd (?).

L. sonorensis Field. Female, Fig. 34. Male, Fig. 35. Blue, red spots on wings.

L. enoptes Boisd. Female, Fig. 32. Male, Fig. 33. Male, blue. Female, brown.

L. acmon, Dbl. Hew. Male blue, female brown. Caudal spots more marked.

L. amyntula Boisd. (?). Female, Fig. 37. Blue-brown.

L. pseudargiolus piasus Boisd. Male, Fig. 40. Blue.

L. marina Reak. Female, Fig. 41. Male, light brown. Female, blue-brown.

L. exilis Boisd. Male. Fig. 42. Blue-brown.

L. hanno Stoll. (?). Fig. 36. Blue-brown.

L. sagittigera Field. Fig. 38. Male, blue. Female, blue-brown.

L. heteronea Boisd. Male, Fig. 39. Male, blue. Female, blue-brown.

PIERIDÆ

Euchlæ australis Grinnell. Female, Fig. 58. White.

E. sara reakirti Edw. Female, Fig. 59. Wings orange tipped.

Colias ariadne Edw. Male, Fig. 60. Female, Fig. 61. Yellow.

C. keewaydin Edw. Male, Fig. 63. Female, Fig. 64. Yellow.

C. harfordii Hy. Ed. Female, Fig. 65. Male, Fig. 66.

C. eurytheme Boisd. Female, Figs. 53 and 54. Male, Fig. 67.

Pieris protodice Boisd.-Lec. Female, Fig. 68. Male, Fig. 69.

White.

Pieris rapæ Linn. Female, Fig. 70.

Meganostoma eurydice Boisd. Male, Fig. 56. Female, Fig. 57.
Male, orange. Female, yellow.

Meganostoma cæsonia Stoll. (?). Male. Fig. 55. Yellow.

PAPILIONIDÆ

Papilio eurymedon Boisd. Male, Fig. 45. Light yellow and black.

P. rutulus Boisd. Male, Fig. 44. Yellow and black.

P. zolican Boisd. Male, Fig. 46. Yellow and black.

P. asterias Cramer (?) Male, Fig. 43. Obtained from student collection. Exact place of collection not known.

HESPERIIDÆ

Hesperia tesselata Edw. Fig. 47.

H. montivaga Reak. Fig. 48.

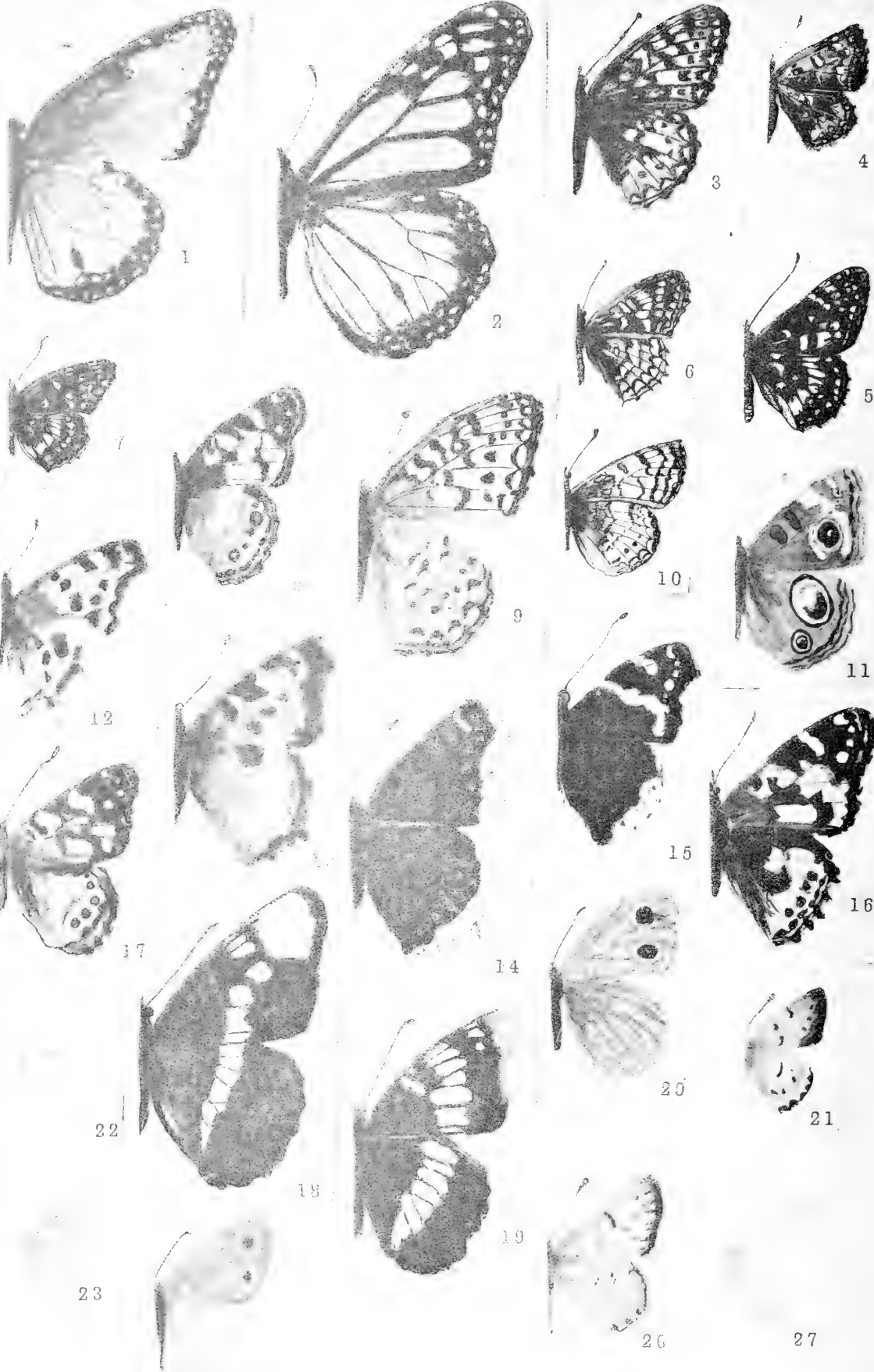
H. ericerorum Boisd. Fig. 49.

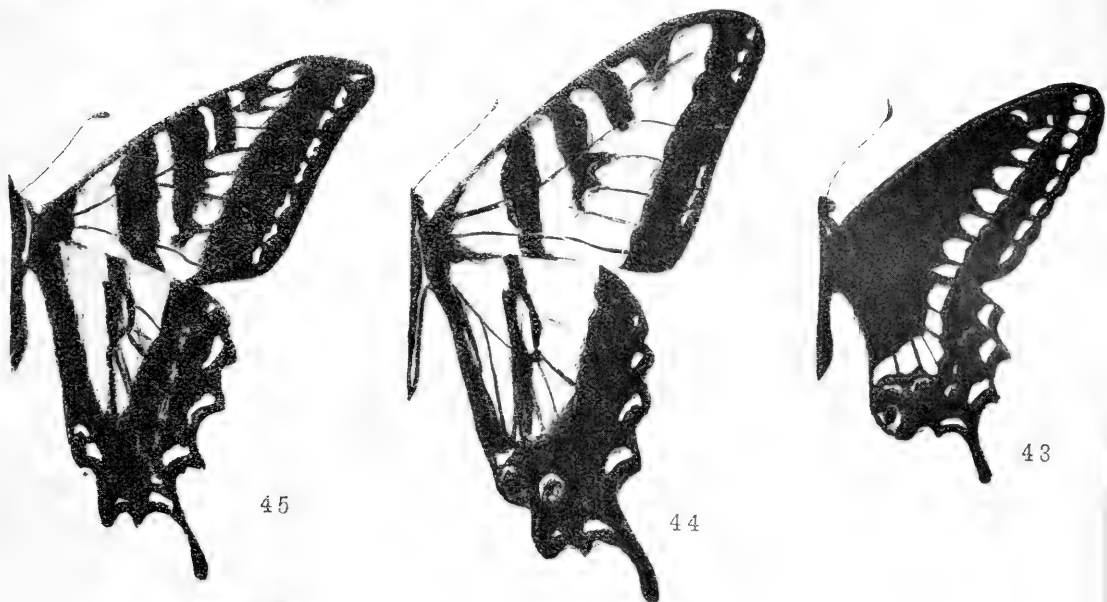
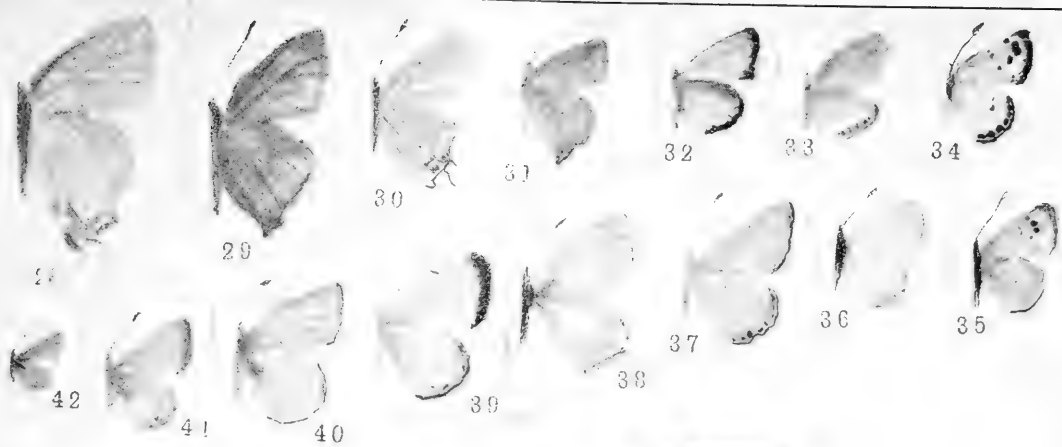
Thanaos clitus Edw. Fig. 50.

Atrytone melane Edw. Fig. 51.

Hylephila phylæus Daury. Fig. 52. Dark red-brown.

(Contribution from the Zoological Laboratory of Pomona College)







A Tentative List of Moths From the Claremont-Laguna Region

For the past four or more years moths have been collected by a number of students both in Claremont and at Laguna. The college collection previous to this time was brought together by Charles Metz and many of the moths were determined by Smith. The more recent collections are by P. A. Lichti, R. Shallenberger, and a few others. Most of the recent determinations are by Barnes and McDonnough and by Busck. In many of the specimens great difficulty was encountered in making out the labels made by many different people and so far as possible Dyar's list was used as a check on these names. The drawings were made by Miss Charlotte Johnson, the photographs by L. O. Cooper. In some cases drawings seemed better than photographs, but there is no good substitute for a specimen. All are natural size or very slightly reduced.

SPINGIDÆ

Protoparce carolina Linn. Det. B., McD. Lichti, collector. Claremont and Laguna Beach, Cal. Yellow spots on abdomen. Fig. 1.

Pholus achemon Drury. Lichti, collector. Claremont, Cal. Fig. 2.

Celerio lineata Fab. Claremont-Laguna. Fig. 3.

Hyloicus drupiferarum A. and S. Claremont. Fig. 4.

Pachysphinx modesta Har. Det. by B. and McD. Lichti, collector. Claremont, Cal. Pink hind wings. Fig. 5.

Hæmmorhagia thetis Bdv. B. and McD. Lichti and students. Claremont, Cal. Fig. 6.

SATURNIIDÆ

Samia rubra Behr. B. and McD. Lichti and students. Mountains, Claremont and Laguna Beach. Fig. 7.

Pseudohazis eglanterina nuttalli Streck. Shallenburger. Bray, collector. Mt. San Antonio, 10,000 feet. Fig. 8, male; Fig. 9, female.

SYNTOMIDÆ

Ctenucha multifaria Wlk. B. and McD. Lichti. Laguna Beach. Fig. 10.

LITHOSIIDÆ

Diacrisia vagans Bdv. B. and McD. Lichti. Laguna Beach. Fig. 11.

Illice liberamacula Dyar. B. and McD. Lichti. Laguna Beach. Fig. 12.

Crambidia suffusa Dyar (?). B. and McD. Lichti. Laguna Beach. Fig. 13.

ARCTEIDÆ

Apantesis autholea Boisd. B. and McD. Lichti. Claremont. Body red, tip of abdomen black. Fig. 14.

Ectypia clio Pack. B. and McD. Lichti. Laguna Beach. Fig. 15.

Archnis picta Pack. B. and McD. Lichti. Laguna Beach. Fig. 16.

Leptarcia californica decia Bdv. Peck. Claremont. Orange hind wing. Fig. 17.

NOCTUIDÆ

Autographa biloba Step. B. and McD. Lichti. Laguna Beach. Fig. 18.

A. californica Spey. B. and McD. Lichti. Laguna Beach. Fig. 19.

A. brassicae Riley. B. and McD. Lichti. Laguna Beach. Fig. 20.

Bryophila viridata Sm. Sm. Metz. Claremont. Fig. 21.

Admetovis similis Barnes. J. B. S. Metz. Claremont. Fig. 22.

Caradrina extimia Walk. J. B. S. Metz. Claremont. Fig. 23.

Copicucullia incresa J. B. S., J. B. S. Metz. Claremont. Fig. 24.

Copablepharon sanctæ-inonicæ Dyar. B. and McB. Lichti. Laguna Beach. Fig. 25.

Cirrhololina mexicana Behr. B. and McD. Lichti. Laguna Beach. Fig. 26.

Cænurgia adversa Grt. J. B. S. Metz. Claremont. Fig. 27.

Copibryophia angelica Grey. J. B. S., J. B. S. Metz. Claremont. Fig. 28.

Catocala osculata Hulst. Hulst. and Shallenberger. Shal. Mountains near Claremont, 5,000 feet. Male. Fig. 29.

Euclidia cuspidata Hbr. J. B. S. Metz. Claremont. Fig. 30.

Feltia annexa Tr. B. and McD. Lichti. Laguna Beach.

Galgula partita Gue. J. B. S. Metz. Claremont. Fig. 31.

Hadena cuculliformis Grote. J. B. S. Metz. Claremont. Fig. 32.

Hiliophila unipuncta Haw. J. B. S. Metz. Claremont. Fig. 33.

Agrotis ypsilon Rot. B. and McD. Lichti. Claremont. Fig. 34.

Heliothis obsoleta Fabr. B. and McD. Houghton. Rivera, Cal. Fig. 35.

H. phlogophagus G. and R. B. and McB. Lichti. Laguna Beach. Fig. 36.

Heliophila imperfecta J. B. S. B. and McD. Lichti. Laguna Beach. Fig. 37.

Inceta aurantica Hy.-Edw. B. and McD. Lichti. Laguna Beach. Fig. 38.

Litocala sensignata Harvey. B. and McD. Lichti. Laguna. Fig. 39.

Morrisonia mucens Hub. J. B. S. Metz. Claremont. Fig. 40.

Mamestra 4-lineata Mor. J. B. S. Metz. Claremont. Fig. 41.

M. cuneata Grote. J. B. S. Metz. Claremont. Fig. 42.

Neuria proclivista Grt. (?). B. and McD. Lichti. Laguna Beach. Fig. 43.

Noctua rivolosa (?) J. B. S., J. B. S. Metz. Claremont. Fig. 44.

N. havila J. B. S., J. B. S. Metz. Claremont. Fig. 45.

Nauangana proliavalis Buly (?). B. and McD. Lichti. Laguna Beach. Fig. 46.

Oncocnemis behrensis J. B. S., J. B. S. Metz. Claremont. Fig. 47.

Mamestra montara J. B. S. J. B. S. Metz. Claremont. Fig. 48.

Laphygma obscura Riley. B. and McD. Lichti. Laguna Beach. Fig. 49.

L. flavemaculata J. B. S., J. B. S. Metz. Claremont. Fig. 50.

Lepipolys perscripta Gue. B. and McD. Lichti. Laguna. Fig. 51.

- Peridroma saucia* J B S., J. B. S. Metz. Claremont. Fig. 52.
Pleonectyptera finitima J. B. S., J. B. S. Metz. Claremont. Fig. 53.
Polia namestra montana J. B. S., J. B. S. Metz. Claremont. Fig. 54.
Polia namestra quadrilineata J. B. S., J. B. S. Metz. Claremont. Fig. 55.
Polia aefkeni Grt. J. B. S., J. B. S. Metz. Claremont. Fig. 56.
Polia iclaudabilis Grt. B. and McD. Lichti. Laguna.
Trachea susquesa Grt. B. and McD. Lichti. Laguna. Fig. 57.
T. fumosa Grt. (near). B. and McD. Lichti. Laguna.
Trichoclea antica J. B. S., B. and McD. Metz. Laguna. Fig. 58.
T. edwardsii J. B. S., J. B. S. Metz. Claremont. Fig. 59.
Syneda ochracea Behr. B. and McD. Laguna. Lichti. Fig. 60.
S. howlandi Grote. B. and McD. Lichti. Laguna. Fig. 61.
Scotogramma chartaria Grote. B. and McD. Lichti. Laguna Beach. Fig. 62.
S. shetchii Edw. J. B. S. Metz. Claremont.
Rancora senatocornis List. B. and McD. Lichti. Laguna. Fig. 64.
Tetanolita greta J. B. S., J. B. S. Lichti. Laguna Beach.
Zosteropoda histipes Grote. J. B. S. Metz. Claremont.
Xylomiges euridlis Grote. J. B. S. Metz. Claremont. Fig. 65.
X. perlubens Grote. J. B. S. Metz. Claremont. Fig. 66.
Zela (Homoptera) salicis Behr. Lichti. Laguna. Fig. 67.
Laphygma frugiperda S. and A. B. and McD. Lichti. Laguna.

NOTODONTIDÆ

- Cerura scolopendria* Bdv. B. and McD. Lichti. Laguna. Fig. 68.
C. cineria var. *unceroides* Dyar. B. and McD. Lichti. Laguna. Fig. 69.

LIPARIDÆ

- Hemerocampa vellusta* Bdv. B. and McD. Lichti. Claremont. Fig. 70.

LASIOCAMPIDÆ

Epicnaptera americana ferruginea Pack. B. and McD. Lichti. Laguna Beach. Red-brown color. Fig. 71.

Gloveria gargamella Stre. B. and McD. Lichti. Laguna Beach. Fig. 72.

DIOPTIDÆ

Phryganidia californica Pack. Shallenberger. Shallenberger. Claremont. Fig. 73.

GEOMETRIDÆ

Cymatophora (Itame) guenearia Pack. B. and McD. Lichti. Claremont. Fig. 74.

Cosymbia serrulata Pack. B. and McD. Lichti. Claremont. Fig. 75.

Diastictis fracturalis Zell. B. and McD. Lichti. Claremont. Fig. 77.

Euphia implicata Gn. B. and McD. Lichti. Laguna. Fig. 78.

Eois lanceolata Hest. B. and McD. Lichti. Laguna. Light colored. Fig. 75.

Eois granitaria Pack. B. and McD. Lichti. Claremont. Darker than the above. Fig. 76.

Glaucina golgolota Hulst. Metz. Claremont. Fig. 79.

G. epiphysaria Dyar. B. and McD. Lichti. Laguna.

Merochlora fascolaria Gr. B. and McD. Lichti. Laguna. Pale green front wing. Fig. 80.

Marmarea occidentalis Hulst. Dyar. Metz. Claremont. Fig. 81.

Neoterpes edwardsata Pack. Dyar. Metz. Claremont. Fig. 82.

Perizoma custodeata Guen. Dyar. Metz. Claremont. Fig. 83.

Platea californiaria H. S. Dyar. Metz. Claremont. Fig. 84.

P. lessaria Pears. B. and McD. Lichti. Laguna. Fig. 85.

Pherne subpunctata Hlt. Dyar. Metz. Claremont. Fig. 86.

Prausta mustelinialis Pack. B. and McD. Lichti. Laguna.

Racheospila glaucomarginaria Barnes Ms. Lichti. Laguna. Fig. 87.

- Sabulodea nudilata* Pack. Dyar. Metz. Claremont. Fig. 88.
Sciagraphia excurrata Pack. B. and McD. Lichti. Laguna.
Fig. 89.
S. californiaria Pack. B. and McD. Lichti. Laguna. Fig. 90.
Stammodes canonymphata Hulst. Dyar. Lichti. Laguna.
Fig. 91.
Selidosema geminata Hulst. Ms. Dyar. Metz. Claremont.
Fig. 92.
Neoterpes edwardsata Pack. Metz. Claremont. Fig. 93.
Stenaspilates apapinaria Dyar. Claremont. Fig. 94.
Zenophleps lignicolorata Pack. Claremont. Fig. 95.
Colymbia serrulata Pack. B. and McD. Lichti. Laguna.
Ceratodalia excurrata Grt. B. and McD. Lichti. Laguna.
Merochlora fascolaria Gue. B. and McD. Lichti. Laguna.
Tornos fieldi Gross. B. and McD. Lichti. Laguna.
Sabulodes caberata Given. Dyar. Lichti. Laguna.
S. nudilata Dyar (?) Lichti. Laguna.
Macaria dieldi Swett. Lichti. Laguna.

FAMILY PYRALIDÆ

- Yuma trabalis* Grote. B. and McD. Lichti. Laguna. Fig. 96.
Dicymolomia metalliferales Pack. B. and McD. Lichti. Laguna.
Fig. 97.
Glaphyria reluctalis Hulst. B. and McD. Lichti. Laguna. Fig.
98.
Hulstia undulatella Clem. B. and McD. Lichti. Laguna. Fig.
99.
Homæosoma mucidellum Ray. (Probably.) B. and McD.
Lichti. Laguna. Fig. 100.
Pyralis farinalis L. B. and McD. Lichti. Laguna. Fig. 101.
Lipocosma (?) *albibamus* Br. B. and McD. Lichti. Laguna.
Fig. 102.
Sarata umbrella Dyar. B. and McD. Lichti. Laguna. Fig.
103.
Nomophila noctuella D. and S. B. and McD. Lichti. Laguna.
Fig. 104.

Ommatopteryx ocella Haw. B. and McD. Lichti. Laguna. Fig. 105.

Ephestiodes nigrella Hlst. B. and McD. Lichti. Laguna.

Diatraea prosenes Dyar. B. and McD. Lichti. Laguna.

Pyrausta xanthocrypta Dyar. B. and McD. Lichti. Laguna.

Glaphyria reluctalis Hulst. B. and McD. Lichti. Laguna.

Lipographis fenestrella Pack. B. and McD. Lichti. Laguna.

Phlyctenia profundalis Pack. B. and McD. Lichti. Laguna.

Sarata umbrella Dyar. B. and McD. Lichti. Laguna.

TORTRICIDÆ

Tortrix peritana Clem. Bus. Lichti. Laguna.

T. citrana Fer. B. and McD. Lichti. Laguna. Fig. 106.

Eucosma sp. Lichti. Laguna.

TINEIDÆ

Acrolophus flavicornis Bus. Busch. Lichti. Laguna.

GELECHIIDÆ

Gelechia sp. *Recurvaria* sp. Bus. Lichti. Laguna.

Phthorimæa operculata Zeller. Busch. Lichti. Laguna.

ELACHISTIDÆ

Morpha sp. B. Lichti. Laguna.

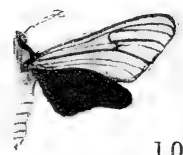
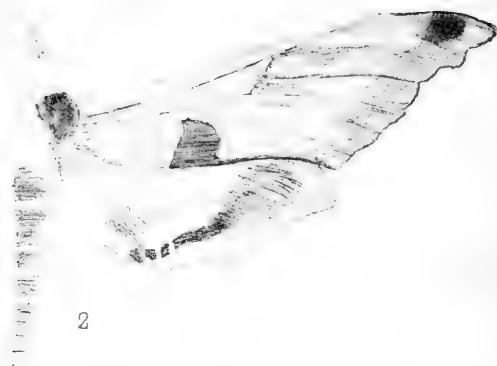
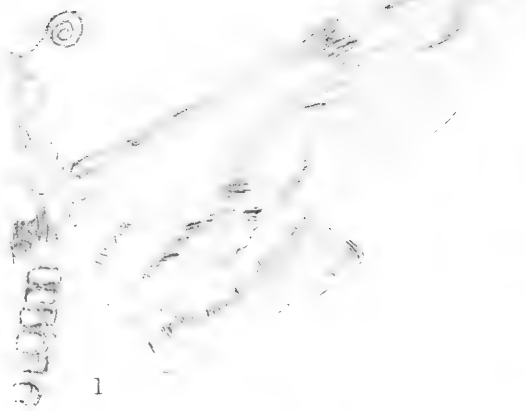
YPONOMEUTIDÆ

Plutella maculipennis Curt. Busch. Lichti. Laguna.

List of somewhat doubtful or imperfect determinations. All collected at Laguna Beach by P. A. Lichti:

Eois demissaria Hub., Fig. 107. *Tardecledia caudifactor* Hbn., Fig. 108. *Pleonectiptera subflavidalis* Grote, Fig. 109. *Givina marga* B. and McD., Fig. 110. *Samcodes subcostalis* Hmp., Fig. 111. *Eusoa sptentriconalis* Wlk., Fig. 112. *Lycophora marginata* Hw., Fig. 113. *Hemella infedelis* Dyar, Fig. 114. *Cænurgina ad-versa* Grt. *Tarache coquillettii* J. B. S. *Eublemma minina* Gro. *Pyramata xanthocrypta* Dyar (?). *Cirphis farcta* Smith. *Eriophyga inorta* Smith. *Dpantesis autholea* Bdv. *Proximes mindara* B. and McD. *Valdinia mirabilicornella* Dyar.

(Contribution from the Zoological Laboratory of Pomona College)





14

15



16



17



18



19



20



21



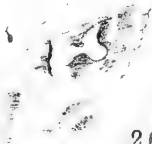
22



24



25



26



27



28



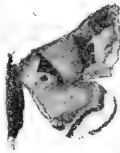
23

31



35

36



30



33



34



39



29



32

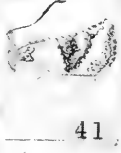


37



38

40



41



42



43



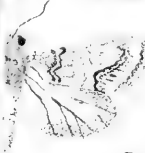
44



45



46



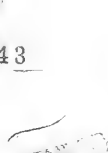
51



50



49



48



47



52

53



54



56



55

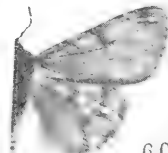
57



59



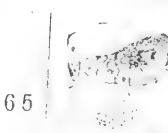
58



60



67



65

62

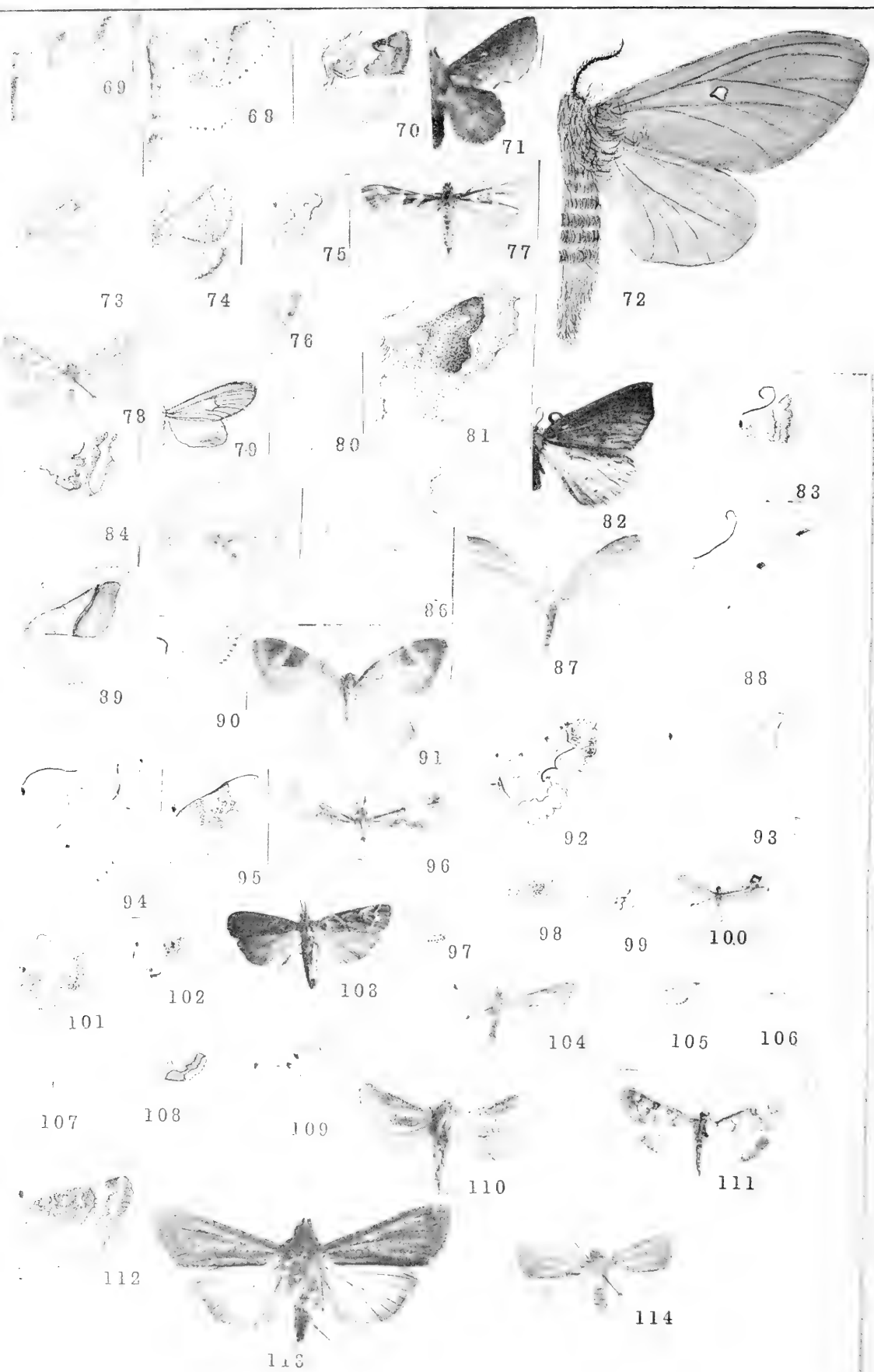
64



61



66



Suggestions From the Study of the Central Nervous Systems of Invertabrates

WILLIAM A. HILTON

For the last few years I have been studying the central nervous systems of a large number of simple animals with a number of objects in view. I wish to learn as much as possible about the *mechanism* of the nervous system, not alone for individual and simple forms, but in general as applied to all groups. The problems of how and where impulses are carried have been among the most interesting. The structures which serve, connect and correlate senses, movements and activities have to me been more interesting than the activities themselves. What all nerve cells with their processes have in common and what differences there are between them have been constantly in mind. The functions of various parts of the neurones and the relations that cells bear to each other are important considerations. How far the relationships of species and groups are carried into the structure of the ganglia and how far adaptations have had their influence are questions not easily answered. With invertebrates as with vertebrates the problems of functional divisions of the nervous system are subjects for investigation. Then there have been the correlations of behavior with structure, not alone in the adult, but also at various stages of development.

Perhaps the dominant thought which has been in mind so far as anatomical studies go, is the question of relationship of cells to each other, of fibers and fibrils to each other and to cells. Are neurones related to neurones in continuous and definite chains, such as are clearly indicated by many Golgi, Methylen Blue and other methods, or are the well known suggestions and conclusions of Apathy that fibrils pass from cell to cell the correct interpretations? It seems that this is a problem of great importance which has not as yet reached a satisfactory solution. Different methods give different results.

The work already done leading towards a comprehension of these problems, if not their solution, has been with many groups of animals, including a few vertebrates. My papers dealing with one or another phase of the nervous system of invertebrates have been published in a number of places. Much unpublished work includes other material, but only a beginning has been made with the investigations which will be necessary for an advanced step in this direction. Some of the work so far, is necessarily of a fragmentary nature and much of the gross anatomy particularly, merely confirms the labors of many in the past. Part of the reason for studying so many forms is to extend my own knowledge so that I may have first-hand experience with all types. Part of the reason for special study here and there is to clear up doubtful points or is directed towards some particular problems in which an animal or group of animals seems to offer special advantages in the way of suggestion or solution. Hardly a form considered in any way but that brings out some important fact, some previously unpublished suggestion. Each separate investigation then may contribute a small part in itself, but each study is directed toward the larger end of attempting to solve some of the most intricate and difficult problems of Biology. More than one line of investigation is being followed, but necessarily the groundwork of future activity must be laid upon anatomical and developmental studies. Other methods are used or are to be used as necessity dictates and such as naturally develop in connection with the attack upon the central problems.

Some of the specific questions which have been in mind from the start are as follows:

1. What is the relation which exists between cell and cell in the central nervous system? Do cells merely run in contact, or is there an organic connection between them, or are both things true?
2. What part does the nucleus play (a) in conduction and (b) in general metabolism of the cells?
3. How are the fibrils related (a) within cells and (b) outside of cells?
4. What is the fibrillar structure of (a) the cell-body and (b) of the material between cells?

5. How are cells related to each other (a) by neurites and dendrites or fibers, and (b) by fibrils?

6. How and where is the impulse carried? How are the non-medullated fibers able to carry a definite stimulus or impulse if they are not insulated?

7. Do nerve cells act in groups, each for a special purpose, or is their effect a massed one, somewhat diffuse and related to other systems? Do impulses pass along definite or diffuse pathways?

8. Does the size of the animal make a difference in the complexity of the nervous system, and is this complexity or lack of it shown in the nervous system as a whole, or in the individual cells which compose it? Do large animals have more nerve cells than small ones? Do large animals have larger nerve cells than the small creatures?

9. Are the conditions in the central nervous systems of invertebrates comparable with those of vertebrates?

10. Are the resemblances which Patton and others have seen in *Limulus* and other invertebrates to vertebrate structures more than chance resemblances, due to special adaptations, or modifications of the nervous system?

11. Is it possible to determine from the brain of an invertebrate the degree of intelligence or instinct from a study of the structure?

12. Is there any higher center in an invertebrate central nervous system or in certain invertebrates which shows something of a directive power in the life of the organism?

13. What are the functional divisions of the nervous systems of invertebrates?

14. Are there advantages in the study of the nervous systems of invertebrates over the study of the brain and ganglia of more complex forms?

15. What are the animals whose nervous systems are adapted for further study of various problems?

Some suggestions in the way of my *present* opinion in respect to certain of these questions are as follows:

1. In some cases it may be that simple contact is the only way cells are related, but from the study of many forms I believe that more intimate relations between cells by means of fibrillae are often

established. The fibrillae from one cell, in many cases, actually mingle with the fibrillae within another cell. Non-medullated fibers, it seems to me, probably afford means of transmission through the sides of the fibers, as well as at the ends, although in many cases the ends may be better adapted for the purpose. It may be that the branchings at the ends of the processes of nerve cells are for the purpose of furnishing a number of contacts which are better than the sides of the fiber.

2. I believe the structure of the nucleus, together with what we know of nuclear composition and structure in general, precludes it from any decided part in conduction. It seems merely a metabolic center of less importance in mature nerve cells, as evidenced by its loss of nuclear material.

3. I believe fibrils are related both within and without cells in a similar manner. That is, they run near, touch or cross to allow the passage of impulses, but do not necessarily fuse.

4. The chief fibrillar material of cell bodies and of areas between cells, I believe, is about the same and is neuro-fibrillar or conductive. A small portion of the cell-body is merely supportive and neuroglia or other cells in the general fibrous mass of a ganglion furnish varying amounts of supportive material between cells.

5. Cells are related to each other grossly very often by neurites and dendrites, but in many, if not all cases, fibrils, either in these and formed from them, or free fibrils, relate cells, not so much as individuals as in groups.

6. The impulse is carried in the fibrils. The stimulus in non-medullated fibers is not so clearly separated as in medullated. There must be some lateral escape to other cells in ways as yet not understood. Some insulation and definiteness in certain non-medullated cells is accomplished by whole bundles for a single purpose protecting the central fibers from much lateral loss. Probably also certain large clearly separated fibers because of their positions are protected from lateral loss.

7. I believe nerve cells do not act as individuals; their effect is a massed one. Many cells supplying a region or a function act in such a way that certain cells or even areas might be lost out entirely and yet the impulse be carried.

8. As a rule the size of the animal makes for a more complex nervous system. Large animals have more and larger cells than related small ones. In the same species embryonic nerve cells may be much smaller than those of the adult, and the proportionate number of cells is greater in certain embryonic stages.

9. Vertebrates and invertebrates are similar as to function of the central nervous system, but the centers are as different as are the peripheral parts.

10. The resemblances which have been found in certain arachnid and arachnid-like forms to the structures of vertebrate brains, it seems to me, are but chance resemblances, analogous, but not homologous, structures. In certain annelids the olfactory portion of the brain is enormously developed for a special adaptation in a limited group of worms. This great olfactory area might be compared to the olfactory portion of the fore-brain of vertebrates, but I think it is clear that we have an analogy merely.

The comparisons of the nervous systems of nemertine worms with those of vertebrates are interesting, but not necessarily significant of relationships.

The segmental character of the radial nervous system of brittle stars might be taken as an indication of relationship to segmented animals with about as much justification.

11. The degree of development of intelligence and instinct, I believe, may be judged to some degree by the relative size of those parts of the brain which are not directly or intimately connected with the sense organs, such as the posterior region of the brain in many segmental animals, or the region of the mushroom bodies of some arthropods and others.

12. If there is any higher psychical center in invertebrates, it seems to me that it must be in the region not dominated by any one center or sense and receiving fibers from all, a center well supplied with nerve cells. Such a center may be the posterior portion of the brain in certain segmented animals.

13. The functional divisions are not well known. In those forms where I have traced the motor and sensory fibers they were mingled in the same nerve trunks in lower regions. The suggestions of some that sensory areas in insects' ventral ganglia are ventral,

is not altogether borne out by the facts. But I believe that the primary condition of a nervous system was superficial and sensory, as development seems to show and as the study of echinoderms seems to indicate.

In the brain some functional divisions are easy to make out in segmental animals, because certain pure sensory nerves are more easily traced.

14. I believe there are certain advantages in the study of simple types of nervous systems.

15. Almost every form so far examined is worthy of re-examination in connection with the solution of general problems.

(Contribution from the Zoological Laboratory of Pomona College)

THE NERVOUS SYSTEM OF THYSANURA.

WILLIAM A. HILTON.

(Department of Zoology, Pomona College, Claremont, California).

The central ganglia of representative genera, *Campodea*, *Evalljapax*, *Lepisma* and *Machilis* were examined.

The first important papers dealing with any of these genera were those of Grassi 1885 and 1888. In both of these, brief discussions of the nervous system are given, but no clear picture of the complete nervous system. Probably the most copied figure of the nervous system of any thysanuran is the one of Oudemans, 1887. In this, a drawing of the complete nervous system of *Machilis* is given which could hardly be improved upon, but the position of the optic lobes, brain and other cephalic parts are not shown in the relations we find them within the body of the animal. In this figure there is a representation of the fine medial nerve. Another paper by Grassi in 1888 shows the general form of the nervous system of *Campodea* and *Japax* and a number of details are clearly given. Bottger, 1910, on *Lepisma saccharina* L. gives a very complete account of the brain and shows it to be very nearly as complex as that of other insects.

Campodea undoubtedly has the most primitive, or at least, the simplest nervous system of any of these insects. The brain is provided with antennal nerves well towards the forward end. The first ventral ganglion is nearly under the brain, then there follow three large thoracic ganglia and seven small abdominal ganglia with the last one a little larger than the rest. This corresponds to Grassi's figure, but this one gives greater detail. It was drawn from gross dissection. No frontal ganglion is shown as one was not clearly recognized in section or dissection. (Figure 1).

Japax or *Evalljapax* in this case, differs quite a little from *Campodea* in appearance, the brain is of different shape, and as it is also without eyes, the forward antennal nerves are the most marked. The ventral ganglia are a little more oval, branches are more prominent and there is one more abdominal ganglion. The last abdominal as in *Campodea*, is a little larger

than the rest. The drawing is from a fresh, completely removed central nervous system. (Figure 2).

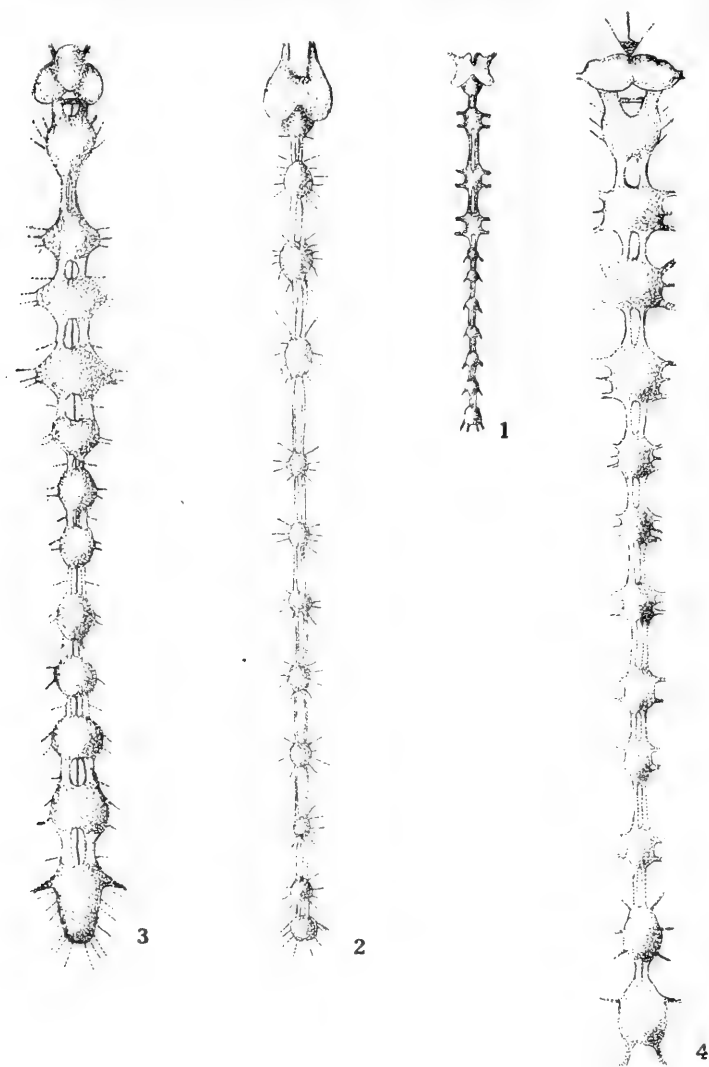


Fig. 1. Central nervous system of *Campodea* from above. $\times 10$.
Fig. 2. Central nervous system of *Evalljapax* from above. $\times 10$.
Fig. 3. Central nervous system of *Machilis* from above. $\times 10$.
Fig. 4. Central nervous system of *Lepisma* from above. $\times 10$.

Machilis has a more complicated brain, partly because of the eye connections; it also has a general transverse direction, as

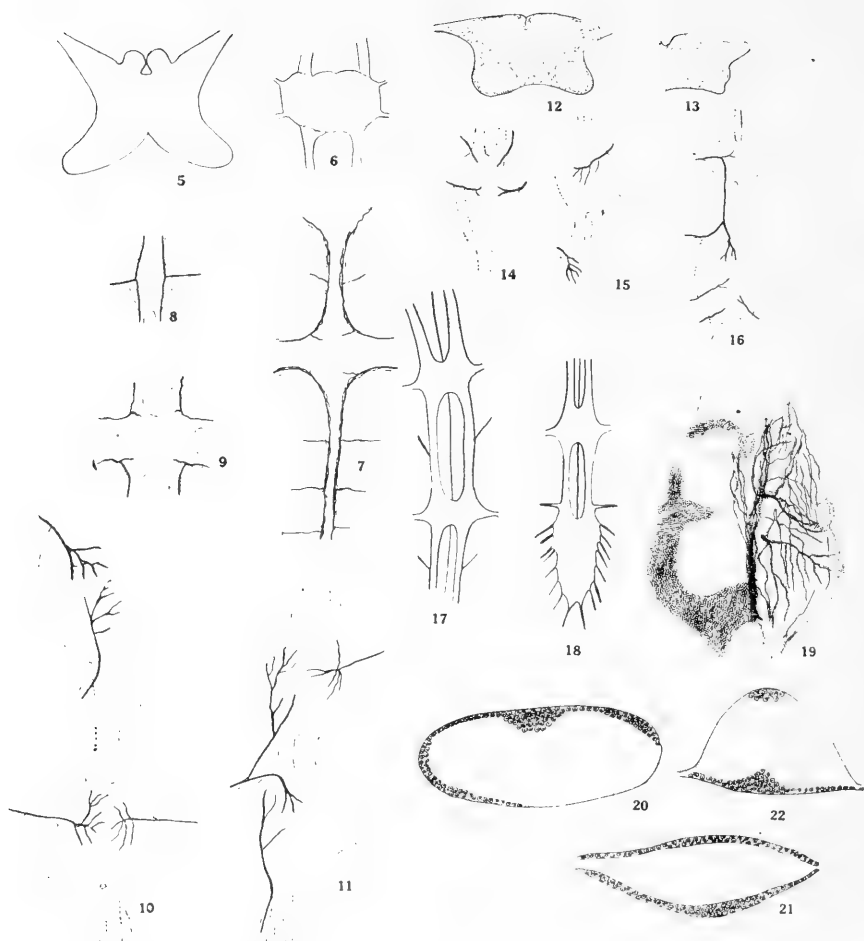
shown in the figure and has quite a little depth. The frontal ganglion is not shown in the figure. The first ventral ganglion is large, so are the three thoracic ganglia. There are eight abdominal ganglia differing somewhat in size and somewhat from Oudemans figure. The median ventral nerve was found much as figured by Oudemans. Perhaps the most marked feature was in the backward extension of the optic lobe region because of the position of the eyes. The figure does not agree with Oudemans, largely because the brain is shown in its natural position as it is found in the head. (Figure 3).

Lepisma resembles *Machilis* very closely, but because of the more lateral and cephalic eyes the brain is more transverse when viewed from above. The frontal ganglion is shown in the figure. (Figure 4).

TRACHEAL DISTRIBUTION.

Trachea can be best studied by removing the ganglia and mounting while still fresh in glycerine. The air in the tracheal tubes remains for a few minutes and the distribution of the trachea may be seen. I found the tracheal distribution much as in the larva of another species. In general, the brain seems supplied by three main trachea on each side. The subesophageal ganglion by two main branches on each side, each ventral ganglion below this with one on each side, but the last ganglion with two branches at least, one of which often has some association with the branch of the next to the last ventral ganglion. Two branches seems to be the usual number for the last ganglion. (Figure 7-16).

It was very difficult to study trachea in the small *Campodea* because it was hard to remove the ganglia in the first place, and second because the trachea remained visible only for a short time. The lower smaller ganglia were each supplied with a single pair of branches, but the supply to the larger cephalic ganglia seemed to be by two sets of main lateral trachea from above and below, each set giving off branches as shown in the figure. The abdominal ganglia are supplied more simply. In none of the centers was there the branching of the tracheoles to the degree found in *Evalljapax*.



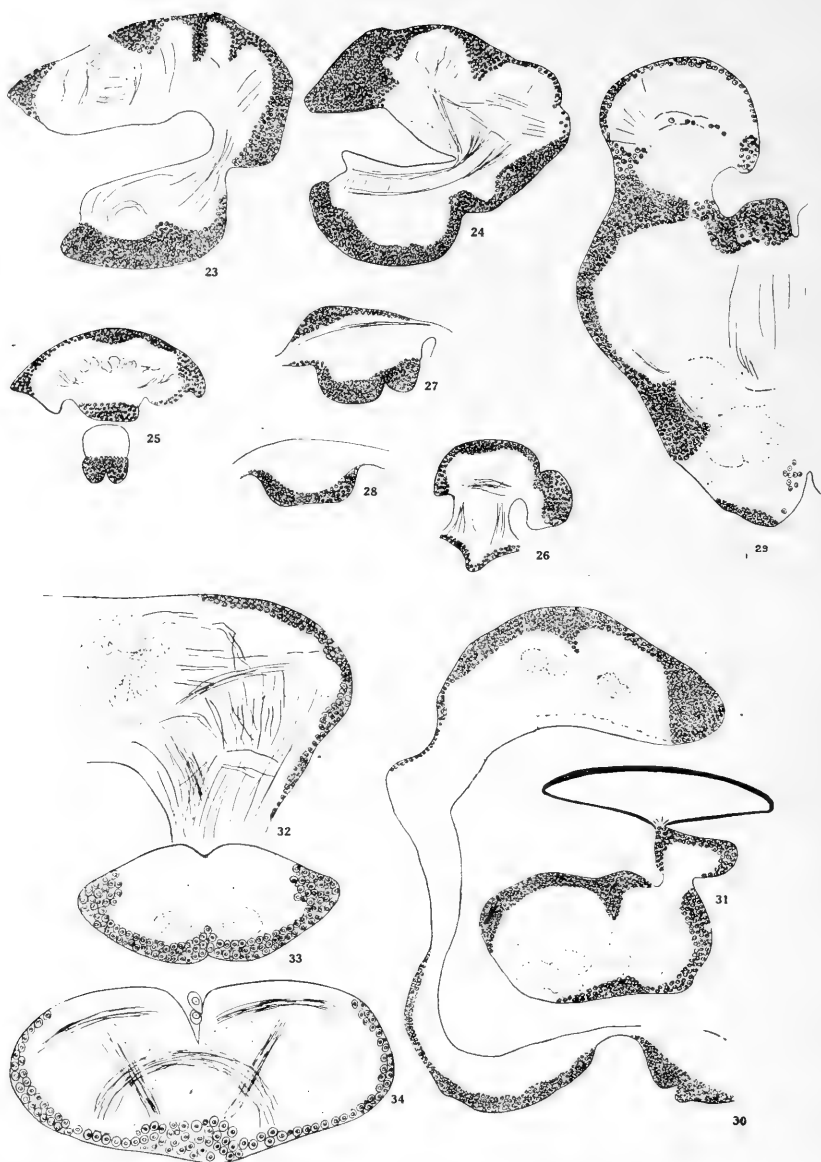
- Fig. 5. Brain of Campodea from above. $\times 75$.
 Fig. 6. Thoracic ganglion of Campodea from above. $\times 75$.
 Fig. 7. Region of last two thoracic ganglia above and some of the abdominal ganglia in the lower part of the figure, from Campodea, showing the lateral tracheal tubes. $\times 75$.
 Fig. 8. One of the abdominal ganglia of Campodea showing tracheal tubes. $\times 75$.
 Fig. 9. One of the thoracic ganglia of Campodea showing tracheal tubes. $\times 75$.
 Fig. 10. Tracheal distribution in the subesophageal and first thoracic ganglion of Evalljapax. $\times 50$.
 Fig. 11. Tracheal distribution in the last two ganglia of Evalljapax. $\times 50$.
 Fig. 12. Brain of Lepisma showing where the deeper masses of cells are as seen from a methylene-blue preparation. $\times 20$.
 Fig. 13. Part of the brain of Lepisma from below showing areas of most abundant cells. $\times 20$.
 Fig. 14. Subesophageal ganglion of Lepisma showing distribution of trachea.
 Fig. 15. Third thoracic and first abdominal ganglia of Lepisma showing tracheal distribution. $\times 20$.
 Fig. 16. Last two abdominal ganglia of Lepisma with tracheal distribution. $\times 20$.
 Figs. 17 and 18. Abdominal ganglia of Machilis, showing medial nerve. $\times 22$.
 Fig. 19. Brain of Evalljapax from above showing distribution of thickest masses of cells on the left side and the distribution of tracheal vessels on the right side. $\times 50$.
 Figs. 20 and 21. Supra- and subesophageal ganglia of evalljapax as shown in longitudinal section. $\times 50$.

GENERAL CHARACTER OF THE BRAIN.

One of the chief differences between the brains of *Campodea* and *Evalljapax* as compared with *Lepisma* and *Machilis* is due to the lack of eyes in the first two. There are numerous differences between the brains of the first two genera. The shape of the brain of *Campodea* is given as it appears when viewed from above in Figure 5. Longitudinal and cross sections through the brain show the ventral parts largely without cells. (Figures 23-26).

The cephalic and mid-dorsal regions are not so well supplied as the lateral dorsal and caudal regions; the caudal lateral region of the brain has the largest mass of cells. Many fibers run from the brain, from or to, forward, median or lateral parts down the connectives to the subesophageal ganglion and farther. There are also numerous small bundles which connect all parts. In the latero-caudal region there are central masses of denser fibers. Three well-marked masses at least may be seen on each side near the dorso-lateral region, Fig. 23. These may represent the areas which in other species help form the mushroom bodies. The brain of *Evalljapax* is shown from above in Fig. 19. On the right side is shown the position of the tracheal tubes of that side and on the other the position of the larger cell areas as shown in the methylene blue preparation. The shape of the ganglion is quite different from that of *Campodea*, as the drawing indicates. There are cells on the dorsal side of the brain, but they are few compared to the other great areas indicated in the drawing. In section the brain seemed simpler in structure than that of *Campodea*, but this in part may have been the fault of the preparation. As in *Campodea*, the ventral regions of the brain are without cells. No clear indication of mushroom bodies was seen, and the connections between different parts of the brain and the connectives and subesophageal ganglion seemed less marked.

Machilis and *Lepisma* also differ from each other to a marked degree in brain structure and arrangement. The general distribution of cells above and below is shown in two figures, 12 and 13, which were stained in methylen blue. In an adult there seem to be not as many cells in proportion to the general area of fibers as in some of the other genera. The middle line both above and below is largely without cells as shown in Fig. 32,



- Fig. 22. Cross section through the first thoracic ganglion of *Evalljapax*. $\times 50$.
 Figs. 23 and 24. Longitudinal sections through the brain and ventral ganglion of *Campodea*. The cephalic end is to the right and the brain is above. $\times 150$.
 Figs. 25 and 26. Cross sections through the brain and first ventral ganglion of *Campodea* taken at different levels. $\times 150$.
 Fig. 27. Longitudinal section through the first thoracic ganglion of *Campodea*, the dorsal side is above, the cephalic end at the left. $\times 150$.
 Fig. 28. Longitudinal section through the second thoracic ganglion of *Campodea*, the dorsal side is up. $\times 150$.
 Fig. 29. Longitudinal section through the brain of *Machilis*. Only one-half is shown. The optic lobe region is at the top of the figure. $\times 150$.
 Fig. 30. Longitudinal section through the brain and two ventral ganglia of *Machilis*. $\times 150$.

which is nearly a cross-section through the brain of an adult. In this a much more complicated structure of fibers and fibrils is presented than in any of the others so far compared. The stalks and roots of the mushroom-bodies are shown in Fig. 32, also the so-called central body. The arrangement of the fibrillar material of the mushroom seems to have a different arrangement and development than in *Lepisma saccharina* studied by Bottger, 1910. In his descriptions and figures an anterior and posterior division of the cap of the fibrous material or "Traube," is given but in the species studied at this time the "Traube" has a different position and is not clearly made up of more than one main lobe on each side. Each of these main lobes as shown in the figure has five secondary lobes instead of four shown by Bottger. In the region of these masses of fibrous material of the mushroom-bodies there are a number of irregular fibrous bundles which may represent other parts of this structure. On the whole, there is a fairly close resemblance to the brains studied by Bottger and differences may be due to the fact that this is not the species which he studied, but our most common local species whose exact identity has not yet been reported to me by special students of this group.

One of the first differences between the brains of *Machilis* and *Lepisma* is shown because of the different position of the eyes. The eyes of *Machilis* are connected with the caudal end and this dorso-caudal region forces the parts of the brain usually found here, farther forward. This is not an unusual condition among the brains of invertebrate animals, in some amphipod Crustacea as compared with nearly related isopods there is a similar shifting. In general, the posterior lobe region of the brain of segmented animals seems to represent its highest center, but shiftings such as just mentioned may often change the usual arrangements.

The second marked difference between *Machilis* and *Lepisma* at least in all specimens studied, both small and large, was in the

Fig. 31. Longitudinal section through the edge of the brain of *Machilis*, the section is through the eye above and to the right. The cephalic end is towards the left. $\times 150$.

Fig. 32.- Cross section through the brain of *Lepisma*, only the right half is shown. $\times 150$.

Figs. 33 and 34. Cross sections through two levels of the first thoracic ganglion of *Lepisma*. The dorsal side is up. $\times 150$.

way of a complete lack of anything which might strictly be called mushroom-bodies in *Machilis*. There are however groups of fibers in the proper region of the brain in specimens of all sizes, but these are hardly more marked than in *Campodea*. The usual distribution of cells was found in this genus. Some indication of the complex but usual arrangement of fibers in the optic lobe region is shown in the Figures. Association, projection and commissural fibers are easily demonstrated. (Figs. 29-31).

In all the brains examined, cells of the usual and well-known types for insect brains were clearly seen. Especially was this the case with the representatives of *Lepisma* and *Machilis*. In these also there were more differences between cells. In all, nerve cells were held in place and otherwise supported by neuroglia cells and neuroglia nets. In all, the fibrils within the central portions of the ganglia formed intricate tangles with the possibility of almost unlimited connections between parts. In the smaller and simpler species few well separated definite tracts were found, fewer than in *Lepisma* and *Machilis*. This is in part due to the fact that the cells, fibers and fibrils are not so large, but there may be other reasons.

The ventral ganglia in the different species differ greatly in complexity. They seem to be the simplest in *Campodea* and the most complex in *Lepisma*. In all, the more abundant cells as is usual, are ventrally placed and the dorsal cells are usually limited to the sides and to a small group in the mid-dorsal line.

If we consider the brain from its three main pairs of nerves or three main regions on each side to consist of three lateral segments, then we must consider the subesophageal ganglion from its nerves and lobings to consist of at least two segments and very possibly more. The first thoracic ganglion in *Machilis* and *Campodea* are evidently composed of two segments as shown in the figures. The cell arrangement and fibrous bands were found to be most complex in *Lepisma*. A few figures are shown of ventral ganglia of several of the species (Figs. 22, 27, 28, 33 and 34) and a more detailed examination of the first thoracic ganglion of *Lepisma*, is given below.

Beginning at the cephalic end we find the two masses of the connectives distinct for a short distance, then cells are located ventrally and laterally, being thickest on the mid-ventral line.

The cells are from one to three layers thick. The fibers in the middle line gradually form into a thick mass of commissural strands. There are also a number of diagonal fibers shown in the plane of the cross section. Farther down a second commissure makes its appearance as a narrow area crossed by coarse fibers. This crosses the center of the ganglion. Farther along a marked, much arched commissure occupies a short distance. The second commissure mentioned is quite extensive but not very thick. More dorsal arched fibers show farther along, these cross to some degree and come from lateral ventral cells, in part at least. In about the central part of the ganglion the other commissures and arched fibers have about disappeared and two small central masses of commissural fibers are evident and two ventral bundles of longitudinal fibers and marked crossings from the ventral to the dorsal side are seen. Farther along the two median commissures give place to one median arched commissure, while many branches are seen at various angles. This arched band disappears and another one comes in contributed to by marked masses of lateral cells. A few dorsal cells send their fibers straight into the ganglion from above. Farther down a more dorsal arched commissure comes in. Later there are two ventral straight bands of fibers and then a single median band reaching from side to side, then very soon the ganglion divides into the two ventral connectives. Cells on the ventral and lateral sides are seen at all levels. A few dorsal cells are seen near the central regions of the ganglion.

In the second thoracic ganglion a similar condition was noted, at least nine commissures were counted.

ABDOMINAL GANGLIA.

A general summary of the structure of abdominal ganglia of *Lepisma* will give an idea of their complexity:

1. Cells chiefly ventral are found in from one to two layers. The lateral ventral groups have three cell layers. There are a few mid-dorsal cells of various sizes.
2. There are in each ganglion a large number of commissures, both straight and arched, ventral and dorsal.
3. Fibers cross dorso-ventrally and caudally.
4. Fibers run short distances to nearby cell groups.

5. Cells of various sizes send fibers into the mass of the ganglion.

6. The longitudinal fibers to the connectives may be found in every part, but they are not always evident because of the many fine fibrils from various regions all woven in with them.

SOME GENERAL CONCLUSIONS.

The nervous systems of the four genera studied show some similarities but many differences. The general position and number of the ganglia is quite similar. Campodea, the least specialized in most respects, has one less ventral ganglion. The general shape of the four brains are quite different, even those without eyes are not alike and those with eyes have them so differently connected with the brain that the whole arrangement of the nervous system at this point is altered. Nerve cells differed chiefly in size and minor arrangements. The largest animals had the largest nerve cells. The general course of fibers and fibrils could be traced but special tracts were not traced very far. The general areas of mushroom bodies were determined for all. Only in *Lepisma* were these structures well developed, in *Machilis* and to a less degree in *Campodea* condensations of fibrils were taken to indicate them.

The general distribution of tracheal vessels is as follows: The brain has three main branches on each side, the sub-esophageal ganglion two branches from each side, the thoracic and abdominal ganglia as a rule have one branch each on a side and the last abdominal ganglion has usually two branches on each side. The brain of *Campodea* was not easily removed, so that the condition there was not so clearly made out, but the appearance so far as could be told was as stated for the rest. The thoracic and abdominal ganglia, however, have a distribution which is not like the rest. Possibly the long lateral trachea on either side with its branches to the ganglia may represent a more primitive if not an absolutely different condition. For this and other reasons I am inclined to think of *Campodea* separated from the other genera by a wide gulf. *Japax* seems separated from the rest by the next widest gulf.

The segregation of fibrils in clumps means a closer union in some places than others; this probably means: 1. Fibrils are closely massed that go in the same direction. 2. In some

places groups are closely correlated because of this relation to each other.

Nuclei are distinct from the fibers and fibrils; they are nutritive centers. The cell bodies also are important in metabolism, but they are not important enough centers for the mingling of many fibers. The individual fibers from cells are less important in the relationship of parts than the groups and masses of fibers and fibrils from many cells in conveying impulses. Association of fibrils seems more important outside of cells than in them. Why should not lateral as well as terminal contacts be important in conveying impulses? The fibrils are carried out in fibers, but the fibrils break away and are distributed in complex ways. It seems that an impulse may flow through ganglia like floods of water through a swamp. The impulses follow the lines of least resistance, if the bundle is large the direction is more definite, if small, of less importance. The nervous system of invertebrates might be compared to the heart and circulation of insects; it, like the heart, receives and passes on, but the distribution is not definite until there is a more perfect insulation. Insulation may be accomplished in several ways: (1) Bundles of fibers protect the central strands with a similar destination from loss to the surrounding parts; (2) The fibers in some cases remain distinct from each other, or the fibers are large and the inner fibrils are protected; (3) Neuroglia cells and neuroglia nets may help a little; (4) In vertebrates the more perfect insulation by means of myalin seems the most efficient protection.

SPECIAL REFERENCES.

- BOTTGER, O. 1910. Das Gehirn eines niederen Insektes (*Lepisma saccharina* L.) Jen. Zeit. f. Naturw. Bd. XLVI.
- GRASSI, B. 1885. I progenitori degli Insetti e Miriapodi. L'Japax e la Campodea. Dagli Atti dell' Accademia Gioenia di Scienze Naturali in Catania. Ser. 3, Vol. XIX.
- . 1885. Contribuzione allo studio dell Anatomia del genere *Machilis*. Lett. all ac. nella tornata. Mem. III.
- . 1888. Anatomia comparata dei Thysanuri. Memoria VII. Reals ac. dei lincei. Roma.
- OUDEMANS, J. T. 1887. Bijdrage tot de kennis der Thysanura en Collembola. Amsterdam.

Early Specimens of Hymenoptera from the Claremont-Laguna Region

Compiled by Charlotte Johnson and Ruth Ledig. Not all families or all in every family are included in this list. Only the first specimens collected are listed. Recent collections are not included and the determinations given in the collection alone are given.

BRACONIDÆ

- Spathiinae spathiini* —. —. Baker. Mountains near Claremont, Cal.
Cheloninae cryptogastonia —. —. Baker. Claremont, Cal.
Cheloninae chelonus —. —. Baker. Mountains near Claremont, Cal.
Cardiochilinae toxoneuron —. —. Baker. Claremont, Cal.
Agathidinae agathinae —. —. Baker. Claremont, Cal.
Blacinae colyptini —. —. Baker. Mountains near Claremont, Cal.
Aphidiinae diaretus, californicus N. sp. —. Baker. Claremont, Cal.
Aphidiinae lysiphlebus citraphis Rehn. —. —. Claremont, Cal.
Aphidiinae lysiphlebus abutilaphidis Rehn. —. —. Claremont, Cal.

ICHNEUMONIDÆ

- Ophioninae campoplegini* B. B. Baker. Claremont, Cal.
O. paniscus B. B. Baker. Mountains near Claremont, Cal.
O. plectiscini B. B. Baker. Mountains near Claremont, Cal.
O. cremastini B. B. Baker. Mountains near Claremont, Cal.
O. ophionini testaceus Baker-n.sp. Baker. Claremont, Cal.
O. ophionini ferruginosus Baker-n.sp. Baker. Claremont, Cal.
O. ophionini fuscus Baker-n.sp. Baker. Claremont, Cal.
O. enicospilus nigrecinctus n.sp. —. Baker. Claremont, Cal.
O. campoplegini zachresta —. —. Baker. Claremont, Cal.
Tryphoninae bassini eriborus [?] *triannulatus* Cam. Cam. Baker. Mountains near Claremont, Cal.
T. bassus nemoralis Gr. 798. Baker. Mountains near Claremont, Cal.
Pimplinae watapimpla —. —. Baker. Claremont, Cal.
P. glypta —. —. Baker. Claremont, Cal.
P. pimpliter —. —. Baker. Mountains near Claremont, Cal.
P. ephialles —. —. Baker. Mountains near Claremont, Cal.
Cryptinae campocryptus brevicornis Cam. n.sp. Baker. Claremont, Cal.
C. otacustes nigro-ornatus Cam. Cam. Baker. Mountains near Claremont, Cal.
C. stibiscapus, crythrostomus Cam. Cam. Baker. Mountains near Claremont, Cal.

MUTILLIDÆ

- Mutilla* [*Dasymutilla*] *orcus* Cr. —. Baker. Claremont, Cal.
Dasymutilla fulvohirta Cr. —. Baker. Claremont, Cal.
Mutilla [*Dasymutilla*] *orcus* Cr. —. Baker. Claremont, Cal.
Dasymutilla pacifica Cr. —. Baker. Claremont, Cal.
Photopsis suthophore Aslm. —. Baker. Claremont, Cal.

MASARIDÆ

- Pseudomasaria edwardsii* Cr. —. Baker. Claremont, Cal.
Pseudomasaria vespoidea Cr. —. Baker. Claremont, Cal.
Euparagia scutellaris Cross. Bradley. Baker. Claremont, Cal.

OXYBELIDÆ

- Notoglossa emarginata* Say. —. Baker. Mountains near Claremont, Cal. Pine Lake, Cal.
Belomicrus cladothericis C.K.I.I. —. Baker. Claremont, Cal.
Belomicrus cookii Baker, n.sp. —. Baker. Claremont, Cal.

CRABONIDÆ

- Blephacipus* —. —. Baker. Mountains near Claremont, Cal.
Xylocrabo —. —. Baker. Mountains near Claremont, Cal.

PEMPHREDONIDÆ

- Spilomena* —. —. Baker. Mountains near Claremont.
Stigmus —. —. Baker. Claremont, Cal.
Neofoxia suffusa Fox. —. Baker. Claremont, Cal.

LATRIDÆ

- Tachysphex* —. —. Baker. Claremont, Cal.
Tachytes —. —. Baker. Claremont, Cal.

PHILANTHIDÆ

- Cerceria* —. —. Baker. Claremont, Cal.
Cerceris ferruginior V. & C. Ph. Coll. Baker. Claremont, Cal.
Cerceris near *Novomexicana* V. & C. —. Baker. Claremont, Cal.
Philanthus crabroniformis —. —. Baker. Claremont, Cal.
Philanthus near *Crabroniformis* —. —. Baker. Claremont, Cal.
Philanthus —. —. Baker. Mountains near Claremont, Cal.
Philanthus cleome Dunn. Vier. Baker. Claremont, Cal.

NYSSIONIDÆ

- Astata* —. —. Baker. Claremont, Cal.
Astata coerulea Cr. —. Baker. Claremont, Cal.
Astata bicolor Say. —. Johnson. Pine Lake, Cal.
Hoplisorde spilopterus Hol. Uh. Coll. Baker. Claremont, Cal.
Hophisoides umbonatus Baker. —. Baker. Claremont, Cal.
Harpactus —. —. Baker. Claremont, Cal.

TRYPOXYLIDÆ

- Trypoxylon* —. —. Baker. Claremont, Cal.

SPHECIDÆ

- Ammophila* near *Collaris* —. —. Baker. Claremont, Cal.
Ammophila near *procera* —. —. Baker. Claremont, Cal.
Ammophila pruvosa Cress. Fernald. Baker. Claremont, Cal.
Pelopæus servillei Lep. —. Fernald. Baker. Claremont, Cal.
Chalybion —. —. Baker. Claremont, Cal.
Psammophila luctuosa Sm. Fernald. Baker. Claremont, Cal.
Psammophila —. —. Baker. Mountains near Claremont, Cal.
Psammophila near *vedlæcei pennis* Lep. —. Baker. Mountains near Claremont, Cal.
Ammophila vulgaris Cr. —. Baker. Mountains near Claremont, Cal.
Ammophila near *centralis* —. —. Baker. Mountains near Claremont, Cal.
Ammophila extremitata Cr. —. Baker. Mountains near Claremont, Cal.

VESPIDÆ

- Polistes aurifer* Sauss. Var. Baker. Mountains near Claremont, Cal.
Vespa occidentalis Cr. —. Baker. Catalina Island.

EUMENIDÆ

- Eumenes crucifera* Prov. Astr. Baker. Mountains near Claremont, Cal.

FORMICIDÆ

- Camponotus hyattii* Var. Baker. N. Var. Wh. —. Baker. Catalina Island, Cal.
Camponotus maculatus Subsp. *vicinus*. Var. *nitidiventris* Em. —. Baker. Catalina Island, Cal.
Camponotus maculatus vicinus Var. *nitidiventris* Em. Wh. Baker. Catalina Island, Cal.
Formica rufa L. Wh. Baker. Mountains near Claremont, Cal.
Formica rufiventris Em. Wh. Baker. Mountains near Claremont, Cal.
Formica pilicornis Em. Wh. Baker. Mountains near Claremont, Cal.
Formica sp. —. Wh. Baker. Mountains near Claremont, Cal.
Cremastogaster lineolata Lay Subsp. *coarclata* Emery. —. Baker. Catalina Island, Cal.
Solenopsis geminata Fab. Wh. Baker. Claremont, Cal.
Solenopsis heminata Fab. —. Baker. Claremont, Cal.

DOLICHECHERIDÆ

- Lapinoma sessile* E. San. W. Baker. Mountains near Claremont.
Liometopus microcephalus Var. *occidentali* Em. Wh. Baker. Claremont, Cal.

MYRMICIDÆ

- Pogonomyrmex* —. Wh. Baker. Claremont, Cal.
Pogonomyrmex californicus Buek. Wh. Baker. Claremont, Cal.
Messor andrei Mayr. —. Baker. Claremont, Cal.
Stenamma (*Messor*) *andrei* Mayr. Wh. Baker. Claremont, Cal.
Pheidole hyattii Em. —. Baker. Claremont, Cal.
Eciton [probably *E. californicum*] Mayr. Wh. Baker. Claremont, Cal.

TENTHRIDINIDÆ

- Schigocerus tristis* Cr. Roh. Baker. Claremont, Cal.
Schyocerus collaris Roh. Roh. Baker. Claremont, Cal.
Poecilostoma kincaidii Maeq. Roh. Baker. Claremont, Cal.
Proctotaxonus typicus Roh. —. Baker. Mountains near Claremont, Cal.
Loderus niger Roh. —. Baker. Claremont, Cal.
Aphanius lenis Cotype ♀ Roh. —. Baker. Mountains near Claremont, Cal.
Claremontia typica Cotype ♂ Roh. —. Baker. Mountains near Claremont, Cal.
Perectia subtruncata —. Dyar. Baker. Claremont, Cal.
Periclista occidentalis Cotype ♀ —. Roh. Baker. Claremont, Cal.
Periclista lercostoma Cotype ♂ —. Roh. Baker. Claremont, Cal.
Cryptocampus bakeri Roh. —. Baker. Mountains near Claremont, Cal.
Cryptocampus bakere Rob. Paratype ♀ Roh. —. Baker. Mountains near Claremont, Cal.
Macrophyta truncata Roh. —. Baker. Claremont, Cal.
Macrophyta nigricornis Roh. —. Baker. Mountains near Claremont, Cal.
Macrophyta pleuricinctella Roh. —. Baker. Claremont, Cal.
Macrophyta multicincta Roh. —. Baker. Claremont, Cal.

PROCTOTRYPIDÆ

- Xenotoma clarimontis* Kieff. —. Baker. Claremont, Cal.
Xenotoma parvicellula Kieff. —. Baker. Claremont, Cal.
Xenotoma rufosignata Kieff. —. Baker. Claremont, Cal.
Xenotoma melanocera Kieff. —. Baker. Claremont, Cal.
Aclista microneura Kieff. —. Baker. Claremont, Cal.
Xenotoma Laeta. Kieff. —. Baker. Claremont, Cal.
Proctotrupes nevadensis Kieff. —. Baker. Mountains near Claremont, Cal.

(BELYTINÆ)

- Liptorhaptus longineris* Kieff. —. Baker. Mountains near Claremont, Cal.
Belyta nigripes Kieff. —. Baker. Mountains near Claremont, Cal.
Pantoclis dubiosa Kieff. —. Baker. Mountains near Claremont, Cal.
Pantoclis californicus Kieff. —. Baker. Mountains near Claremont, Cal.

BETHYUNAE

- Ephyris eriagoni* Kieff. —. Baker. Claremont, Cal.
Epyris indvidus Kieff. —. Baker. Mountains near Claremont, Cal.
Epyris clarimontis Kieff. —. Baker. Claremont, Cal.
Parasierola cellularis Var. *punctaticeps* Say. Kieff. —. Baker. Mountains near Claremont, Cal.

(DRYEICINÆ)

- Galesus clarimontis* Kieff. —. Baker. Mountains near Claremont, Cal.
Diapria montana Kieff. —. Baker. Mountains near Claremont, Cal.

FIGITIDÆ

- Amblynotus* Kieff. —. Baker. Mountains near Claremont, Cal.
Figites coloradensis Asher. —. Baker. Claremont, Cal.
Ganaspis reclusa Kieff. —. —. Mountains near Claremont.

CYNIPIDA

- Synergus flavipes* Kieff. —. Baker. Mountains near Claremont, Cal.
Andricus pomiformis Bass. —. Baker. Mountains near Claremont, Cal.
Callirhytis eriophora Kieff. —. Baker. Mountains near Claremont, Cal.
Callirhytis polythra Kieff. —. Baker. Claremont, Cal.
Callirhytes pacificus Asher. —. Baker. Mountains near Claremont, Cal.
Callirhytis agrifolia Bass. —. Baker. Claremont, Cal.

CHALCIDIDÆ
(EURYTOMIDÆ)

- Eurytoma* from galls of *Calhirsytis maculipennis* —. —. Baker. Claremont, Cal.
Decatoma from galls of *Calhirsytis maculipennis* —. —. Baker. Claremont, Cal.
Brasema ruficollis Gam. Baker. Claremont, Cal.
Eupelmus [?] Claremont, Cal.

TORYMIDÆ
TORYMINÆ

- Torymus* from galls of *Callirhytis* Baker. —. Baker. Mountains near Claremont, Cal.
Prospalltetla How. —. Stahl. Claremont, Cal.
Aphycus florus How. —. Stahl. Claremont, Cal.
Aspidiotiphogus citrinus Craw. —. Stahl. Claremont, Cal.
Diarthronomyia californica Esit. —. Stahl. Claremont, Cal.

Coleoptera from the Claremont-Laguna Region

Compiled from the Collections of Pomona College by Lea Myers.

All the local determined beetles are here listed as they are found in the Cook-Baker collection. More recent specimens are not listed if they are the same as those in the original collection.

HYDROPHILIDÆ

- Tropisternus* s.p. —. —. Metz. Claremont, Cal., Portland, Oregon. Dark brown with lighter brown border on wings and prothorax. Oval shaped. 10 mm x 5½ mm.
- Tropisternus limbalis* Lec. Fall. —. Laguna Beach, Cal. Dark brown with narrower light brown border on wings and prothorax. Larch spur on each leg. 10 mm x 5½ mm.
- Tropisternus salsamentus* Fall. Fall. —. Laguna Beach, Cal. Very dark brown. Oval shaped. 9 mm x 4½ mm.
- Tropisternus californicus* Lec. Fall. —. Laguna Beach, Cal. Black. Oval shaped. Antennæ very short. 9 mm x 5 mm.
- Philhydrus californicus* Horn. —. —. Laguna Beach, Cal. Shiny brown. Oval shaped. Small thread-like antennæ. 6 mm x 3 mm.
- Cercyon fimbriatum* Mann. Fall. Baker. Laguna Beach, Cal. Brown. Wing covers ridged. Oval shaped. Antennæ short. 3 mm x 2 mm.

LAMPYRIDÆ

- Telephorus ingenuus* Lec. Fall. Baker. Claremont, Cal., and mountains near. Dark grey with tan prothorax and a black stripe running from eye to eye. Soft wing covers, prominent eyes. Long antennæ. 7½ mm x 3½ mm.
- Telephorus tibiellus* Cemm. —. Baker. Claremont, Cal. Light brown with reddish brown legs and prothorax and head. Eyes black. Soft wing covers and long antennæ. Rectangular shaped beetle. 16½ mm x 4½ mm.
- Malthodes* n. sp. —. Fall. Baker. Claremont, Cal. Grey with brown prothorax and head. Long antennæ, short wing covers. Small prothorax. 3½ mm x 1½ mm.

LATHRIDIIDÆ

- Lathridius armatulus* Fall. Fall. Baker. Claremont, Cal. Bronze colored. Narrow prothorax and head with large abdomen. Short clubbed antennæ. 2½ mm x 1 mm.

LUCANIDÆ

- Sinodendron rugosum* Mann. Fall. —. Claremont, Cal. Dull black. Body slightly rough. Head with turned-up hook on it. Prothroax divided into two parts, with median dorsal line on second part. Also small projection on prothorax. 11½ mm x 5 mm.

MALACHIDÆ

- Collops marginicollis* Lec. Fall. Baker. Laguna; Claremont, Cal. Blue with reddish brown prothorax and legs. First two joints of antennæ thick and triangular. Prothorax covered with long hairs. 4 mm x 3 mm.
- Collops marginellus*. Lec. Fall. Baker. Claremont, Cal. Blue with black prothorax and head. Short brown antennæ. 4 mm x 2½ mm.
- Collops argutus* Fall. Fall. Baker. Mountains near Claremont, Cal. Brown with black markings. Covered with short brown hairs. First two segments of antennæ large and peculiarly shaped. 4½ mm x 2½ mm.
- Malachius acutipennis* Fall. Fall. Baker. Claremont, Cal. Brown with orange prothorax, and orange tips on wing covers. Antennæ resemble sawteeth. Long legs. 5 mm x 5½ mm.
- Malachius uniformis* Fall. Fall. —. Claremont, Cal. Black with blue wing covers. Abdomen extending beyond wing covers. 5 mm x 2½ mm.

- Microlipus* n. sp. Fall. Baker. Mountains near Claremont, Cal. Grey with orange prothorax and the tips of the wing covers orange. Long saw-toothed antennæ. Prominent eyes. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Attalus trimaculatus* Motz. Fall. Baker. Laguna Beach, Cal. Orange brown with dark brown markings. Bead-like antennæ. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Attalus lobulatus* Lec. Fall. Baker. Claremont, Cal. Black with light brown rim around the wing covers. Bead-like antennæ. Tip of abdomen showing. 2 mm x $1\frac{1}{2}$ mm.
- Pristoscelis grandiceps* Lec. Fall. —. Laguna Beach, Cal. Shiny black. Covered with hairs. Long prothorax and head. Long rectangular shaped beetle. 5 mm x $2\frac{1}{2}$ mm.
- Pristoscelis squalidus* Lec. Fall. Baker. Mountains near Claremont, Cal. Shiny black. Covered with hairs. Prominent eyes. Bead-like antennæ. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Trichochrous squalidus* Lec. Fall. Baker. Claremont, Cal.; Laguna Beach, Cal. Grey, covered with fine grey hairs. Short antennæ. Prothorax rounded. 4 mm x 2 mm.
- Trichochrous conspersus* Casey. Fall. Baker. Mountains near Claremont, Cal. Black covered with grey hairs. Short bead-like antennæ. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Trichochrous* sp. —. Fall. Baker. Claremont, Cal. Rusty black, covered with fine grey hairs. Bead-like antennæ. 3 mm x $1\frac{1}{2}$ mm.
- Trichochrous* sp. —. Fall. —. Laguna Beach, Cal. Black, covered with long black hairs. Rather oval-shaped. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Trichochrous anescens* Lec. Fall. Baker. Laguna Beach, Cal. Shiny black. Short antennæ, thick. 2 mm x 1 mm.
- Listrus* sp. —. Fall. Baker. Claremont, Cal. Black, with grey markings. Short, rather thick, antennæ. $2\frac{1}{2}$ mm x 1 mm.
- Listrus diffeis* Lec. Fall. Baker. Mountains near Claremont, Cal. Grey with black markings. Antennæ medium length and rather thick. 3 mm x $1\frac{1}{2}$ mm.
- Listrus famelicus* Casey. Fall. Baker. Claremont, Cal. Black with grey markings. Short thick antennæ. Quite prominent eyes. $2\frac{1}{2}$ mm x 1 mm.

MELOIDÆ

- Nemognathus scutellaris* Lec. Fall. Baker. Claremont, Cal. Yellowish brown. Long prothorax. $6\frac{1}{2}$ mm x 3 mm.
- Nemognatha* —. Fall. —. Claremont, Cal. Brown. 8 mm x 3 mm.
- Epicanta oblita* Lec. Fall. Baker. Mountains near Claremont, Cal.; Laguna Beach, Cal. Black. Slender with small round head. 7 mm x 2 mm.
- Cantharis auriculata* Horn. Fall. Baker. Claremont and mountains near. Bluish green with orange on the head. Covered with fine white hairs. $10\frac{1}{2}$ mm x $3\frac{1}{3}$ mm.
- Cantharis æneipennis* Lec. Fall. —. Claremont, Cal. Green with red prothorax and head. Wing covers rough as though covered with fine pores. Abdomen a little longer than wing covers. 11 mm x 4 mm.
- Cantharis childii* Lec. —. —. Southern California. Black with orange around front portion of prothorax. Half of abdomen extending beyond wing covers. $13\frac{1}{2}$ mm x $4\frac{1}{2}$ mm.
- Cantharis cyanipennis* Say. —. —. Southern California. Peacock green with black legs and antennæ. Head and prothorax shaped like a house-fly's. Antennæ very short. 16 mm x $5\frac{1}{2}$ mm.
- Calospota elegans* Lec. Fall. Baker. Claremont, Cal. Black with orange markings on wings. Last segment of antennæ oval shaped. Prothorax triangular with small part at the base of the head. $8\frac{1}{2}$ mm x 3 mm.
- Tegrodera crosa* Lec. —. —. Claremont, Cal. Veins of wing covers are yellow with brown background and brown tips. Prothorax is brown. Head is deep orange or red. Head contains two deep creases. Prothorax has a deep crease lengthwise. $23\frac{1}{2}$ mm x $9\frac{1}{2}$ mm.

MOIDELLIDÆ

- Moidella scutellaris* Fab. Fall. Baker. Claremont, Cal. Black. Prothorax broad as the body. Abdomen pointed and extending downward below wing covers. Antennæ short. 5 mm x 2 mm.
- Moidellistena vilis?* Lec. Fall. —. Laguna. Black. Body tapering to a point. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

NITIDULIDÆ

Nitidula ziczac Say. Fall. Baker. Claremont, Cal. Brown with lighter brown markings. Large prothorax. Wing covers covering all but last segment of abdomen. 4 mm x 2 mm.

Carpophilus pallipennis Say. Fall. Baker. Claremont, Cal. Dark brown with light brown wing covers. Wing covers short. Abdomen pointed. 4 mm x 2 mm.

OEDEMERIDÆ

Copidita cyanipennis Horn. Fall. Baker. Claremont, Cal. Purple in color. Palpi resembling short antennæ. 6 mm x 2½ mm.

Copidita 4 maculata Mob. Fall. Laguna. Light brown with greyish brown wing covers. Palpi quite long and prominent. Body long and slender. 15 mm x 4 mm.

Asclera excavata Lec. Fall. Baker. Claremont, Cal. Black with brown prothorax. Body slender. Palpi protruding forward like antennæ. 6 mm x 2 mm.

OTIORHYNCHIDÆ

Orphryastes latinostis Lec. Fall. —. Claremont, Cal. Dark grey with lighter, grey head. Wing covers and prothorax covered with small indentations. Snout or trunk large. Prothorax and top of head region have central crease. 15 mm x 7½ mm.

Eupagoderes varius Lec. —. —. Claremont, Cal. White with grey stripes running lengthwise. Head cream-colored. Antennæ short. Body very rounded. 10 mm x 5 mm.

Rhigopsis effracta Lec. Fall. Baker. Claremont, Cal. Dark grey and black. Body rough. Short clubbed antennæ. 6 mm x 3 mm.

Mimetes setulosus Lec. Fall. Baker. Claremont, Cal. Very dark grey. Body ribbed lengthwise. Prothorax spherical. Wing covers taper to a point. 7½ mm x 3 mm.

Aramigus fulleri. Horn. Fall. Baker. Claremont, Cal. Greyish brown. First segment of antennæ extremely long and antennæ clubbed. Eyes are prominent. 7½ mm x 3½ mm.

Scythopus californicus Horn. Fall. Baker. Claremont, Cal. Brown. Body slender. Antennæ short and clubbed. Mandibles hard and pointed. 7½ mm x 2½ mm.

PARNIDÆ

Dryops productus Lec. —. Metz. Claremont, Cal. Rusty black. Large prothorax. 8 mm x 3 mm.

PTINIDÆ

Ptinus agnatus Fall. Fall. Baker. Claremont, Cal. Brown. Long antennæ. Small prothorax and head. Prothorax and head round. Wing covers oval-shaped. Long hairs on the body. 2½ mm x 1½ mm.

Sinoxylon declive Lec. —. —. Claremont, Cal. Black with red legs. Large broad prothorax with short broad head covered with hairs. 6 mm x 2½ mm.

Polycaon stontii Lec. Fall. Baker. Claremont and mountains near. Black. Head and prothorax covered with fine hairs. Eyes prominent. Large strong-looking mandibles. 19½ mm x 6½ mm.

RHIPIPHORIDÆ

Rhipiphorus dimidiatus Fab. Fall. Baker. Mountains near Claremont, Cal. Black with yellow wing-covers tipped with black. Antennæ comb-like. Long prothorax pointed at the base of the wings. Wing-covers pointed at the ends. 7 mm x 2½ mm.

Rhipiphorus cruentatus Germ. Fall. Baker. Mountains near Claremont, Cal. Orange with black meso and metathorax and black wing tips. Comb-like antennæ and long pointed prothorax. 5 mm x 2 mm.

RHYNCHITIDÆ

Reporaus [*Rhynchites*] *glastinus* Lec. Fall. Baker. Mountains near Claremont. Dark brown. Long slender head. Long oval-shaped prothorax. Tips of wing-covers rounded. Last two segments of antennæ enlarged. 3½ mm x 2 mm.

SILPHIDÆ

Silpha ramosa Say. —. —. Claremont, Cal.; Reno, Nev.; Sheridan, Wyo. Dull black. Rough wing covers. Finely segmented club-like antennæ. Large, broad prothorax and very small head. 14 mm x 7 mm.

Necrophorus nigritus Mann. —. —. Claremont, Cal. Black. Three segments of abdomen extending beyond the square-cut wing-covers. Antennæ have red plumes on the ends. Legs covered with fine hairs. Prothorax grooved. Eyes large. 21 mm x $9\frac{1}{2}$ mm.

STAPHYLINIDÆ

Cafus canescens Mäkl. Bemb. Baker. Laguna, Cal. Grey-black. Almost no wings; body slender. 7 mm x 2 mm.

Cafus seminitens Horn. Fall. —. Laguna, Cal. Black; wings dull; thorax, head and abdomen shining. Thorax slightly ridged. $9\frac{1}{2}$ mm x 3 mm.

Cafus luteipennis Horn. Bernh. Baker. Laguna Beach, Cal. Abdomen reddish brown; head and thorax brown; short wing covers tan. Rather prominent scutellum. $5\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Cafus lithocharinus Lec. Bernh. Baker. Laguna Beach, Cal. Body dark brown with tip of abdomen reddish and the ends of the wing covers a lighter brown. Head broader than thorax. $6\frac{1}{2}$ mm x 2 mm.

Cafus sulcicollis Lec. Bernh. Baker. Laguna Beach, Cal. Dark brown with tip of abdomen a lighter shade. $4\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Boletobius cincticollis Say. —. Baker. Claremont, Cal. Reddish brown, tan wing covers with brown spot on the end. Small head. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Boletobius californicus —. Bik. Baker. Mountains near Claremont, Cal. Abdomen brown, head and thorax tan; tan wing covers with brown spot on end. Thorax and abdomen tapering to a point at caudal end. 4 mm x 2 mm.

Anthobium atriventre Cas. —. Baker. Mountains near Claremont, Cal. Tan in color. Wing covers covering almost all of the abdomen. 2 mm x 1 mm.

Pelecomalium floribundum Lec. —. Baker. Mountains near Claremont, Cal. Head, thorax and legs red; abdomen brown, and wing covers tan. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Protinus sulcatus Fauv. Fall. Baker. Mountains near Claremont, Cal. Dark brown with red legs. Clubbed antennæ. $1\frac{1}{2}$ mm x 1 mm.

Tachyporus californicus Horn. —. Baker. Claremont, Cal. Golden brown with brown abdomen. Abdomen covered with long hairs. 3 mm x $1\frac{1}{2}$ mm.

Sculptilis Casey. —. Baker. Mountains near Claremont, Cal. Black with white markings. Very prominent eyes. $5\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Sunicus Cas. —. Baker. Mountains near Claremont, Cal. Black. Head and thorax small. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Layi Cas. —. Baker. Mountains near Claremont, Cal. Dull black. Prothorax small. 4 mm x $1\frac{1}{2}$ mm.

Lathrobium jacobinum Lec. —. Baker. Mountains near Claremont, Cal. Dark shiny brown with red legs. Long and slender. 8 mm x $1\frac{1}{2}$ mm.

Bledius latecollis Lec. —. Baker. Mountains near Claremont, Cal. Brown body with tan legs and wing covers. Small head. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Bledius ruficornis Lec. —. Baker. Mountains near Claremont, Cal. Dull black prothorax and head; tan wing covers; shiny black abdomen. $3\frac{1}{2}$ mm x 1 mm.

Aleochara pubenita Kg. —. Baker. Claremont, Cal. Tan with short dark brown wing covers. Short, thick antennæ. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

Aleochara bipustulata Lec. —. Baker. Claremont, Cal. Shiny black. Short wing covers; short thick antennæ. 3 mm x 1 mm.

Platystethus americanus Er. —. Baker. Claremont, Cal. Black. Head and prothorax round. Wing covers and abdomen short. Medium length antennæ, clubbed at the end. 3 mm x $1\frac{1}{3}$ mm.

Atheta picipennis Okkl. —. Baker. Mountains near Claremont, Cal. Black with short brownish wing covers. Legs relatively long. Ventral side covered with fine hairs. $2\frac{3}{8}$ mm x 1 mm.

Atheta dentata Bh. —. Baker. Mountains near Claremont, Cal. Dull black. Short thick antennæ. Wing covers about a third the length of abdomen. $2\frac{1}{2}$ mm x 1 mm.

A. occidentalis Bernh. —. Baker. Mountains near Claremont, Cal. Shiny black with brownish grey wing covers. Last two segments of abdomen larger than others. 3 mm x 1 mm.

A. sordida Mann. —. Baker. Claremont, Cal. Black with bronze colored wing covers. Body tapering towards the tip of the abdomen. Prothorax with a trans-

- verse furrow. Antennæ thick and finely segmented. Fine hairs extending on either side of the abdomen. $3\text{ mm} \times 1\frac{1}{3}\text{ mm}$.
- A. fenyon* Bernh. —. Baker. Claremont, Cal. Black with dark brown wing covers. Antennæ short and finely segmented. Small hairs extend from the ventral side of the abdomen. $3\text{ mm} \times 1\text{ mm}$.
- Haphdeny flavipennis* Cas. —. Baker. Mountains near Claremont, Cal. Black with greyish brown wing covers. Short, finely segmented antennæ. Abdominal segments large and few. $3\frac{1}{2}\text{ mm} \times 1\text{ mm}$.
- Pontomalota bakeri* Bernh. Bernh. Baker. Laguna Beach, Cal. Tan or yellowish brown with third segment from the top of the abdomen dark in color. Prothorax with a transverse ridge. Last segment of antennæ dark in color.
- Tarphiota pallidipes* Cas. Bernh. Baker. Laguna Beach, Cal. Black. Short fine antennæ. $2\frac{1}{3}\text{ mm} \times \frac{2}{3}\text{ mm}$.
- Tarphiota pacifica* Bernh. Bernh. Baker. Laguna Beach, Cal. Black. Medium length antennæ with the last segment broader than others. Transverse crease on prothorax. $3\text{ mm} \times 1\text{ mm}$.
- Quediis explanatus* Lec. —. Baker. Mountains near Claremont, Cal. Black. Antennæ resembling horns and finely segmented. Long prothorax. Last segment of abdomen covered with fine hairs. Other segments contain some hairs. Prothorax large and smooth. $12\text{ mm} \times 4\text{ mm}$.
- Staphylinus paphyrenus* Lec. —. Baker. Mountains near Claremont, Cal. Black with prothorax and wing covers deep purple. Reddish legs and antennæ with last two segments of abdomen a dark brown. Antennæ medium length and bead-like. Head large and round. Prothorax with a transverse median line. $10\text{ mm} \times 3\text{ mm}$.
- Creophilus villosus* Grav. —. Metz. Claremont, Cal. Black with greenish grey markings on wing covers and abdomen. Covered with fine hairs except prothorax, which is smooth. Antennæ clubbed and bead-like. $19\text{ mm} \times 6\text{ mm}$.
- Hadrotes crassus* Man. Fall. —. Laguna Beach, Cal. Black. Antennæ bead-like. Large prothorax. Legs covered with short hairs. $13\frac{1}{2}\text{ mm} \times 4\text{ mm}$.
- Philonthus triangulum* Horn. —. Baker. Claremont, Cal. Black with brownish red wing covers. Long legs with fine hairs over the legs and body. Antennæ short and club-like. $6\text{ mm} \times 2\text{ mm}$.
- Philonthus nigrifolius* Grav. —. Baker. Mountains near Claremont, Cal. Black. Bead-like antennæ. Large head and prothorax. $4\text{ mm} \times 1\frac{1}{3}\text{ mm}$.
- Philonthus longicornis* Steph. —. Baker. Claremont, Cal. Black. Narrow oval-shaped head, narrower than prothorax and prothorax narrower than abdomen. Bead-like antennæ. $8\frac{1}{2}\text{ mm} \times 2\frac{1}{2}\text{ mm}$.
- Staphylinus tarsus* Lec. Fall. —. Claremont, Cal. Black. Bead-like antennæ. Prothorax with a transverse line. Large mandibles. $13\frac{1}{2}\text{ mm} \times 4\text{ mm}$.

TROGOSITIDÆ

- Trogosita virescens* Fab. —. —. Claremont, Cal.; Reno, Nev. Shiny blue or green. Short antennæ, long protruding head. Long prothorax. $12\frac{1}{2}\text{ mm} \times 4\frac{1}{2}\text{ mm}$.
- Tenebrioides californica* Horn. Fall. Baker. Claremont, Cal. Dark brown. Ribbed wing covers. Large flat prothorax. Large flat head extending forward. Short antennæ. $7\frac{1}{2}\text{ mm} \times 2\frac{1}{2}\text{ mm}$.

ANTHICIDÆ

- Corphyra inconspicua* Horn. Fall. Baker. Claremont, Cal. Black body, brown prothorax. Prothorax round, head bead-like. $6\text{ mm} \times 2\frac{1}{2}\text{ mm}$.
- Notoxus constrictus* Casey. Fall. Baker. Laguna Beach, Cal. Tan with brown stripe crosswise of wing cover. Head much narrower than prothorax. Prothorax extending to a point over head, which is turned downwards. $4\text{ mm} \times 2\text{ mm}$.
- Notoxus sparsus* Lec. Fall. Baker. Mountains near Claremont, Cal. Brown with two darker brown stripes running crosswise of wing covers. Prothorax extending to a point over the head. Head turned down underneath the large portion of prothorax. $3\text{ mm} \times 1\frac{1}{2}\text{ mm}$.
- Notoxus calcaratus* Horn. Fall. Baker. Claremont, Cal. Tan with two brown spots and two brown stripes on wing covers. Prothorax and head have same general position and shape as above. Larger than the above one. $4\frac{1}{2}\text{ mm} \times 2\text{ mm}$.

- Notoxus constrictus* Casey. Fall. Baker. Claremont and mountains near. Tan with two spots and one stripe of dark brown on wing covers. Head and prothorax shaped the same as former. Antennæ finely segmented. 3 mm x 1½ mm.
- Notoxus sparsus* Lec. Fall. Baker. Claremont, Cal., and mountains near. Grey with dark brown marking. Prothorax reddish brown. Prothorax resembles head with eyes and pointed snout. Bead-like antennæ. 3 mm x 1½ mm.
- Notoxus* n. sp. —. Fall. Baker. Claremont, Cal. Dark brown. Prothorax and head both round with decided break between the two. Antennæ bead-like. 3 mm x 1 mm.
- Anthicus formicarius* Goeze. Fall. Baker. Claremont, Cal., and mountains near. Dark brown with lighter brown prothorax. Prothorax becomes larger at head region. Head round and small area attached to prothorax. 3 mm x 1½ mm.
- Tappus* n. sp.? —. Fall. Baker. Laguna Beach, Cal. Reddish brown with black wing covers. Palpi clubbed at the end. Prothorax larger at head region. Head round and flat. Antennæ bead-like. 2½ mm x 1 mm.

BRUCHIDÆ

- Bruchus limbatus* —. Fall. —. Claremont, Cal. Smoke grey with a light brown stripe on each wing. Body short and thick. Prothorax oval shaped with bead-like head set on to it. Antennæ short and thick. 2½ mm x 1½ mm.
- Bruchus pruininus* Horn. Fall. Baker. Mountains near Claremont, Cal. Dark brown with grey spots. Oval shaped. Last segment of abdomen extending beyond wing covers. A grey spot on each wing and one on prothorax. 2 mm x 1½ mm.

BUPRESTIDÆ

- Anthaxia æneogaster* Fab. Fall. Baker. Claremont and mountains near. Bronze colored. Prothorax broad. Eyes elongate. Short thread-like antennæ. Green on ventral side. 5½ mm x 2½ mm.
- Anthaxia æneogaster* Fab. Fall. Baker. Claremont and mountains near. Bronze colored. Head and thorax rectangular in shape and as broad as wing covers. 4 mm x 2 mm.
- Chrysolothris dileta* Lec. Fall. Baker. Claremont, Cal. Bronze colored. Short antennæ. Veins in wings prominent. 8 mm x 3 mm.
- Acmeodera gemina* Horn. Fall. Baker. Mountains near Claremont, Cal. Brown with gold markings. Beetle long and slender. Short thick antennæ. 5½ mm x 2 mm.
- Acmeodera labyrinthica* Fall. Fall. Baker. Claremont, Cal. Bronze with gold spots. Body covered with long fine hairs. Ends of wing covers rough. 9½ mm x 4 mm.
- Acmeodera acuta* Lec. Fall. Baker. Claremont, Cal. Bronze with gold spots with a tinge of purple. Covered with fine hairs. Prothorax containing a median line. 8½ mm x 3 mm.
- Acmeodera prepburnii* Lec. Fall. Baker. Claremont, Cal. Bronze with considerable tan markings on wing covers. Similar in general appearance to above except for markings in color. 11 mm x 4½ mm.
- Acmeodera fenyesi* Fall. Fall. Baker. Claremont, Cal. Bronze with a few yellow spots on wing covers. Covered with long fine hairs. Wing covers taper to a point. 9 mm x 3½ mm.
- Acmeodera guttifera* Lec. —. Baker. Mountains near Claremont, Cal. Dark bronze colored with a few yellow spots. Short antennæ. 6½ mm x 2 mm.
- Aguilus jacobinus* Horn. Fall. Baker. Claremont and mountains near. Bronze. Body long and slender. Short antennæ. Soft wing covers. 1 mm x 2 mm.

BYRRHIDÆ

- Amphicyrta dentipes* Fr. Fall. Baker. Mountains near Claremont, Cal. Black. Oval shaped [almost spherical]: Small thread-like antennæ. Small short legs. Head small, not prominent from dorsal view. 8 mm x 5½ mm.

CALANDRIDÆ

- Sphenophorus monterensis* (romerinus) Lec. —. Fall. Laguna Beach, Cal. Black. Large prothorax. Small pointed head with trunk. Antennæ knobbed. 10½ mm x 3½ mm.
- Scyphophorus yuccæ* Horn. —. —. Claremont, Cal. Black. Wing covers ribbed and shorter than abdomen. Prothorax large and flat. 15 mm x 6½ mm.

CERAMBYCIDÆ

- Cyllene antennatus* White. Fall. —. Claremont, Cal. Brown with grey prothorax

- and grey markings on the wing covers. Antennæ nearly as long as the body. Body tapering. 21 mm x 7 mm.
- Xylobrechus insignis* Lec. Fall. —. Laguna Beach, Cal. Head and prothorax black. Wing covers brown with horizontal stripes of yellow. Legs a light brown. Head small and flat. Prothorax sphere-shaped. 20½ mm x 5½ mm.
- Xylotrechus naaticus* Mann. Fall. —. Claremont, Cal. Dark brown with bronze markings on the wing covers. Body quite slender. 14 mm x 4½ mm.
- Tragidion annulatum* Lec. Fall. —. Laguna Beach, Cal. Black velvety head, thorax and legs, with burned orange colored velvety wing covers. Prothorax pointed on either side. Wing covers slightly ridged. 25 mm x 8 mm.
- Strangalia delicata* Lec. Fall. Baker. Claremont, Cal. Black with the base of the wing covers tan, and red legs. Body slender and wasplike. Wing covers large at the base and small at the tip. Antennæ as long as the body. Abdomen extending beyond wing covers. 11 mm x 2 mm.
- Leptura instabilis* Hold. Fall. —. Claremont, Cal. Golden brown with black spots. Head small, body large in comparison. Antennæ about half as long as body. 14 mm x 7 mm.
- Leptura sexspilota* Lec. Fall. Baker. Claremont, Cal. Dull brown with black spots. Reddish colored legs. Last segment of abdomen extending beyond wing covers. Head small and pointed. Prothorax with a crease in the middle running lengthwise. 9 mm x 4 mm.
- Leptura molybdica* Lec. Fall. Baker. Claremont, Cal. Dark green head and prothorax. Blue wing covers with orange spots at base. Body slender. 5½ mm x 2½ mm.
- Ipochus fasciatus* Lec. Fall. Baker. Claremont, Cal. Greyish brown with gray markings on wing covers. Body and prothorax both rounded. Head short and nearly as broad as prothorax. Antennæ nearly as long as body. 8 mm x 3½ mm.
- Synaphæta cuexi* Lec. —. —. Claremont, Cal. Grey with brown spots. Antennæ a little longer than body. Antennæ containing few joints. Prothorax pointed on the sides. 20 mm x 10 mm.
- Prionus californicus* M. —. —. Claremont, Cal. Large brown beetles. Antennæ pointed on either side of each joint. Scutellum shaped like a semicircle. Two jagged prongs on each side of prothorax. Antennæ in front of the eyes. 46½ mm x 20 mm.
- Asemum moestum* Hald. Fall. —. Claremont, Cal. Black. Head short and flat, forming with the prothorax a rounded appearance. Prothorax as broad as body. Antennæ short. 12½ mm x 5 mm.
- Criocephalus productus* Lec. —. —. Claremont, Cal. Reddish brown. Antennæ containing a spine at every joint. Antennæ moderately long. Eye patch large, extending back and below antennæ. Wing covers curved in at the tips. 37 mm x 11 mm.
- Hylotrupes ligneus* Fab. Fall. Baker. Claremont, Cal. Black with gold markings. Prothorax rounded. Wing covers rectangular. Head small and pointed. 11½ mm x 3½ mm.
- Phymatodes obscurus* Lec. Fall. Baker. Claremont, Cal. Dark brown. Antennæ as long as body. Prothorax round with lengthwise ridge. Femur of legs shaped like an Indian club. 13 mm x 4½ mm.
- Purpuricenus dimidiatus* Lec. Fall. Metz. Claremont, Cal. Black with rust red colored prothorax and base of the wings. Antennæ over half the length of body. 15 mm x 5½ mm.

CHRYSOMELIDÆ

- Lema trivittata* —. Fall. Baker. Claremont, Cal. Black and greenish brown striped. Stripes running lengthwise. Head and prothorax much narrower than the rest of body. Antennæ thick. 6½ mm x 3 mm.
- Coscinoptera æncipennis* Lec. Fall. Baker. Claremont, Cal. Bronze colored with grey thorax and head. Prothorax extending over the top of the head. Body short, prothorax as broad as body. Antennæ very short. Eyes small and bead like. 7 mm x 3½ mm.
- Saxinis saucia* Lec. Fall. Baker. Claremont, Cal. Blue with red spots on both sides, at the base of the wings. Short with prothorax extending over the top of the head. Wing covers squared at the tips. 5½ mm x 3 mm.

- Exema conspersa* Mann. —. Metz. Claremont, Cal. Rusty black. Small, rough, oval shaped. 3 mm x 2 mm.
- Cryptocephalus sanguinicollis* Suffr. Fall. Baker. Claremont, Cal. Black with red prothorax. Antennæ very short and thread-like. 4 mm x 3 mm.
- Cryptocephalus spuncus* Lec. Fall. Baker. Mountains near Claremont, Cal. Brown with darker brown longitudinal stripes. Wing covers ridged. $4\frac{1}{2}$ mm x $2\frac{1}{2}$ mm.
- Pachybrachys punctatus* Bowditch. Fall. Baker. Laguna Beach, Cal. Brown or brown with black markings. Head extending a little beyond prothorax. Body short, rough and rectangular. $3\frac{1}{2}$ mm x 2 mm.
- Pachybrachys hybridus*? Supr. Fall. Baker. Claremont, Cal., and mountains near. Black with red prothorax. Wing covers ridged lengthwise. Thread-like antennæ clubbed at the end. $3\frac{1}{2}$ mm x 2 mm.
- Glyptoscelis squamulatus* Cr. Fall. Baker. Laguna Beach and Claremont, Cal. Grey or brownish grey. Covered with short grey hairs. Prothorax narrower than the body and oval shaped. 8 mm x $4\frac{1}{2}$ mm.
- Chysochus cobaltinus* Lec. Fall. Hamilton. Claremont, Cal.; Laguna Beach, Cal. Metallic blue or green color. Prothorax small, head invisible from dorsal view. 11 mm x $6\frac{1}{2}$ mm.
- Colaspidea varicolor* Cr. Fall. Baker. Claremont, Cal. Bronze colored. Small prothorax with short thick body. Head not evident from dorsal view. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Glyptoscelis smaragdulus* Lec. Southern California. Dull green or a dull purple. Small prothorax which extends over the top of the head. $4\frac{1}{2}$ mm x $2\frac{1}{2}$ mm.
- Haltica carinata* Germ. Fall. Baker. Claremont, Cal. Wine colored, changing to green. Prothorax oval shaped. Bead-like antennæ. $4\frac{1}{2}$ mm x $2\frac{1}{2}$ mm.
- Crepidodera cucumeris* Harr. Fall. Baker. Claremont, Cal. Black, Wing covers ridged longitudinally. Oval shape. $1\frac{1}{2}$ mm x 1 mm.
- Trirhabda flarolimbata* Mann. Fall. Baker. Laguna Beach; Claremont, Cal.
- Monoxa* Fall. Baker. Claremont, Cal.
- Monoxa puncticallis* Say. Fall. Baker. Laguna Beach, Cal.
- Crepidodera subcrinita* Lec. Santa Monica, Cal. Dark brown. Small oval-shaped body. 2 mm x $1\frac{1}{2}$ mm.
- Systema taeniata* Say. Fall. Metz. Baker. Claremont, Cal. Tan body with brown stripes lengthwise of wing covers. Brown head. Small head projecting beyond prothorax. Bead-like antennæ. $3\frac{1}{2}$ mm x 2 mm.
- Glyptina atriventris* Horn. —. Fall. Pomona, Cal. Medium brown. Oval shaped. 2 mm x 1 mm.
- Glyptina cerina* Lec. —. —. Pomona, Cal. Tan colored. Small prothorax extending over head. 2 mm x 1 mm.
- Odontota californica* Horn. Fall. Baker. Mountains near Claremont, Cal. Tan colored. Wing covers ridged lengthwise. Short thick bead-like antennæ. 4 mm x 2 mm.
- Cassida texana* Cr. Fall. Baker. Claremont and mountains near. Pea green color. Soft transparent wing covers and prothorax. Body oval shaped. Head not seen from dorsal side. Antennæ club-like. $5\frac{1}{2}$ mm x $3\frac{1}{2}$ mm.
- Diachus auratus* Fabr. Fall. —. Laguna Beach, Cal. Dull green with bronze prothorax. Large prothorax. $1\frac{1}{2}$ mm x 1 mm.
- Psylliodes punctulata* Mels. Fall. Baker. Laguna Beach, Cal. Black. Ridged wing covers. Large femur. Oval shaped. 3 mm x 2 mm.
- Longitarsus livens* Lec. Fall. Baker. Laguna Beach, Cal. Tan colored. Oval shaped. Medium length antennæ. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Luperodes torquatus* Lec. Fall. Baker. Mountains near Claremont, Cal. Peacock green body and head with light brown prothorax. Slender oval shaped. Square shaped prothorax. $3\frac{1}{2}$ mm x 2 mm.
- Diabrotica tenella* Lec. —. Baker. Claremont.
- Diabrotica trivittata* Mann. —. Baker. Laguna Beach, Cal.

CICINDELIDÆ

- Cicindela tranquebarica* Horn. —. —. San Bernardino, Cal.; Laguna Beach, Cal. Green with a few gold markings. Black legs and eyes. Eyes prominent, prothorax small. Long sharp pointed mandibles. $13\frac{1}{2}$ mm x $5\frac{1}{2}$ mm. tufts of hairs. $11\frac{1}{2}$ mm x $4\frac{1}{2}$ mm.

- Cicindela oregana* Lec. —. —. Claremont, Cal. Black with yellowish tan markings. Small prothorax, moderately long antennæ. Ventral view of body with *Cicindela pacifica* Lec. Fall. —. Laguna Beach, Cal. Greenish black with brownish black head and prothorax. Rather long legs and long pointed mandibles. 13 mm x 5 mm.

CISTELIDÆ

- Cistela opaca* Lec. Fall. Baker. Claremont, Cal. Dull black. Small pointed head. Antennæ nearly as long as body. Wing covers ridged, coming to a point at the tip. 7 mm x 3 mm.
Isomira luscidiosa Casey. Fall. Baker. Claremont, Cal. Medium brown. Oval shaped. Thread-like antennæ. 5 mm x 2½ mm.

CLERIDÆ

- Trichodes ornatus* Say. Fall. Baker. Claremont, Cal. Black with greenish yellow markings. Prothorax and head covered with fine yellow hairs. Clubbed antennæ. 10½ mm x 3½ mm.
Hydnocera scabra Lec. Fall. Baker. Mountains near Claremont, Cal. Black. Prominent eyes. Head broader than prothorax. 5 mm x 2 mm.
Lebsiella inaculicollis Lec. Fall. Baker. Claremont, Cal. Blue with red prothorax and black head. Covered with fine hairs. Clubbed antennæ. 4 mm x 2 mm.
Necrobia rufipes Fab. Fall. Baker. Claremont, Cal. Peacock green with red legs. Prothorax and head covered with fine hairs. Clubbed antennæ. Wing covers finely ridged. 4½ mm x 2½ mm.

COCCINELLIDÆ

- Hippodamia ambigua* Lec. —. Baker. Claremont and Pomona, Cal. Red with black prothorax and head. Very short antennæ. Oval shaped. 7½ mm x 4½ mm.
Hippodamia convergens Lec. —. Baker. Claremont, Cal. Red and black. Red wing covers with black spots. Black prothorax with two yellow spots. Black head. 7 mm x 4½ mm.
Coccinella californica Fab. —. Baker. Claremont, Laguna Beach, Cal. Black prothorax and head, reddish brown wing covers. Almost round in shape. 7 mm x 4½ mm.
Coccinella sanguinea L. Fall. Baker. Mountains near Claremont, Cal. Black head and prothorax with dark red wing covers. Small round beetle. 4 mm x 3½ mm.
Coccinella abdominalis Lay. —. Baker. Claremont, Cal. Yellowish green with black spots. Spots run in parallel rows. 5 mm x 4 mm.
Chicorus vivulnerus Muls. —. —. Claremont Cal. Black with two red spots. small prothorax. Round. 4½ mm x 4 mm.
Psyllobora tadata Lec. —. Baker. Santa Paula, Cal.; Claremont, Cal.; Laguna, Cal. Tan with two darker shades of brown spots. 2½ mm x 2 mm.
Hyperaspis lateralis Muls. —. Baker. Claremont, Cal., and mountains near. Black with three bright red spots on each wing cover. 3½ mm x 2½ mm.
Hyperaspis fimbriolata Welsh. —. Baker. Claremont and mountains near. Black with a greenish yellow spot on the edge of each wing cover. 2½ mm x 2 mm.
Hyperaspis spiculnota Fall. Fall. Baker. Mountains near Claremont, Cal. Black with three greenish yellow spots on each wing cover. 2½ mm x 2 mm.
Hyperaspis taeniata Lec. Fall. Baker. Claremont, Cal., and mountains near. Black with a greenish yellow spot on the outer edge of each wing cover. 2 mm x 1½ mm.
Exochomus fasciatus Casey. Fall. Baker. Claremont, Cal., and mountains near. Black head and prothorax. Red wing covers with two black spots on each. 3½ mm x 2½ mm.

CUCUJIDÆ

- Silvanus advena* Fall. Baker. Claremont, Cal. Light brown. Knobbed antennæ. 2 mm x 1 mm.

CURCULIONIDÆ

- Sitones* —. Fall. Baker. Claremont, Cal. Brownish grey with black specks. Elongate; beak broad and squared. 5½ mm x 2½ mm.
Cleonus [*Lixus*] *modestus* Mann. Fall. Baker. Mountains near Claremont, Cal. Grey with ventral side a paler grey. Beak moderately long and slender but blunt; eyes round and flat. 9½ mm x 2 mm.

- Dinocleus* [*Centrocleonus*] *albovestitus* Cas. Fall. —. Claremont, Cal. Black covered with fine grey hairs. Antennæ short and thick, coming from ventral side of beak. 15 mm x $5\frac{1}{2}$ mm.
- Docytomus hystricula* Casey. Fall. Baker. Mountains near Claremont, Cal. Dark grey with red legs. Short black antennæ. 3 mm x $1\frac{1}{2}$ mm.
- Orchestes puberulus* Boh. Fall. Baker. Claremont, Cal. Greyish brown with red legs. Small pointed head and broad rounded body. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Tychius prolixus* Casey. Fall. Baker. Claremont, Cal. Brown with grey and black striped head. Wing covers finely ridged. 4 mm x 2 mm.
- Copturus adspersus* Lec. Fall. Baker. Claremont, Cal. Black with white spots. Beak curved under the body and black. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Ceutorhynchus disturbatus* Dietz. Fall. Baker. Claremont, Cal. Brown with a few white markings. Body broad and rounded with slightly pointed head. Two white streaks on wing covers parallel to the tips of the wings. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Baris rubripes* Casey. Fall. Baker. Mountains near Claremont, Cal. Dark red. Ridged wing covers. Body oval shaped. Antennæ short and clubbed. $4\frac{1}{2}$ mm x 2 mm.
- Trichobaris compacta* Casey. Fall. —. Claremont, Cal.; Laguna, Cal. Black with fine grey hairs running in parallel lines except for the portion of the head above the beak, which has no hairs. $4\frac{1}{2}$ mm x 3 mm.
- Endalus* n. sp. —. Fall. Baker. Laguna Beach, Cal. Black or red. Prothorax short and broad. $2\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.
- Epimechus mimicus* Dietz. Fall. Baker. Laguna Beach, Cal. Black. Short with broad abdomen. 3 mm x 2 mm.
- Emphyastes fucicola* Mann. Fall. Baker. Laguna Beach, Cal. Reddish brown. Prothorax round and shiny. Abdomen oval. 6 mm x $2\frac{1}{2}$ mm.
- Phycocotes testaceus* Lec. Fall. Baker. Laguna Beach, Cal. Brown. Knobbed antennæ. Shape similar to above. $3\frac{1}{2}$ mm x $1\frac{1}{2}$ mm.

DASCYLLIDÆ

- Allopegon villosus* Horn. Fall. Baker. Claremont, Cal. Black. Covered with brown hairs. Medium length antennæ with triangular shaped segments. Small prothorax and head, long ribbed wing covers. $5\frac{1}{2}$ mm x 2 mm.
- Anorus piceus* Lec. Fall. Baker. Claremont, Cal., Laguna, Cal. Light brown. Long antennæ. Soft wing covers. Prominent eyes. $10\frac{1}{2}$ mm x $3\frac{1}{2}$ mm.
- Helodes apicalis* Lec. Fall. Baker. Mountains near Claremont, Cal. Brown. Long antennæ. Small prothorax and head. 5 mm x 2 mm.
- Cyphon concinnum* Lec. Fall. Baker. Mountains near Claremont, Cal. Dark brown with large light brown spot on each wing. Medium length antennæ. Oval shaped. $3\frac{1}{2}$ mm x 2 mm.

DERMESTIDÆ

- Byturus guescens* Lec. Fall. Baker. Claremont, Cal. Greyish brown with grey markings. Short antennæ. Oval shaped. 3 mm x $1\frac{1}{2}$ mm.
- Dermestes talpinus* Mann. Fall. Metz. Claremont, Cal. Black with grey and brown markings. Covered with short hairs. Sartellum covered with a tuft of yellow hairs. Antennæ short with last three segments forming a red knob. 7 mm x $3\frac{1}{2}$ mm.
- Dermestes marmoratus* Say. —. —. Claremont, Cal., Reno, Nev. Black with two large grey spots and several smaller ones. Antennæ very short and knobbed. Legs covered with short spines. 11 mm x 5 mm.
- Megorama frontalis* Lec. Fall. Baker. Claremont, Cal. Greyish brown. Oval shaped. Antennæ very short. 4 mm x $2\frac{1}{2}$ mm.

DYTISCIDÆ

- Deronectes striatellus* Lec. Fall. Baker. Claremont, Cal., and mountains near. Black. Oval shaped. Prothorax pointed where the wing covers join. Thread-like antennæ. 4 mm x $2\frac{1}{2}$ mm.
- Hydroporus vilis* Lec. Fall. Baker. Mountains near Claremont, Cal. Black with very dark brown wing covers. Oval shaped. $3\frac{1}{2}$ mm x 2 mm.
- Thybiosoma regularis* Lec. Claremont, Cal. Dark reddish brown. Oval shaped. Short, thread-like antennæ. Wing covers meeting in almost invisible line. 12 mm x $6\frac{1}{2}$ mm.

Agabus lecontei Cr. Fall. Metz. Claremont, Cal. Dark brown with lighter brown wing covers. Palpi small and not clubbed. Antennæ short and thread-like. $8\frac{1}{2}$ mm x 5 mm.

Agabus lugens Lec. Fall. —. Claremont, Cal. Very dark brown. Oval shaped. Small black eyes. 10 mm x 5 mm.

Colymbetes strigatus Lec. Fall. —. Dark brown. Wing covers covered with fine ridges running cross wise of wings, resembling layers of muscles on tough part of one's hand. Eye patch contains four eyes. 18 mm x $8\frac{1}{2}$ mm.

EROTYLIDÆ

Dacne californica Horn. Fall. Baker. Mountains near Claremont, Cal. Dark brown. Oval shaped. Clubbed antennæ. 3 mm x $1\frac{1}{2}$ mm.

GYRINIDÆ

Gyrinus consobrinus Lec. —. Metz. Claremont, Cal. Shiny black. Oval shaped. Fine ridges running lengthwise of wing covers. Eyes on the top of the head. $7\frac{1}{2}$ mm x $3\frac{1}{2}$ mm.

HISTERIDÆ

Hololepta fossularis Say. —. Baker. Claremont, Cal. Black. Large prominent mandibles. Antennæ short with red knobs. Large prothorax. Wing covers short, covering little over half of abdomen; have grown fast to body. Legs short. $17\frac{1}{2}$ mm x 7 mm.

Hololepta vicina Say. Fall. —. Claremont, Cal. Shiny black. General appearance of former, except smaller. $9\frac{1}{2}$ mm x 4 mm.

Saprinus sulcifrons Lec. —. —. Redondo, Cal. Shiny black. Tibia of leg comb-like on the edge. Beetle oval shaped. Wing covers contain two ridges on each. 7 mm x $4\frac{1}{2}$ mm.

Saprinus vitrosus Lec. —. Metz. Claremont, Cal. Black. Oval shaped, almost round. Short antennæ. Wing covers not covering tip of abdomen. 3 mm x $2\frac{1}{2}$ mm.

Saprinus pectoralis Lec. Fall. Baker. Claremont, Cal. Shiny black. Large prothorax. Short wing covers with few longitudinal creases. 4 mm x 3 mm.

Sabunus pæminosus Lec. Fall. Baker. Claremont, Cal. Shiny black. Short wing covers creased. 4 mm x 3 mm.

Saprinus lugens Lec. Fall. Baker. Claremont, Cal., and mountains near. Black. Large prothorax. Oval shaped. Short wing covers. 7 mm x 5 mm.

Hister sellatus Lec. Fall. Claremont, Cal. Black and red. Black with red wing covers with black border on them. Three lengthwise creases on each wing. Broad flat tibia with row of spurs on each side. 5 mm x 4 mm.

Acritus maritimus Lec. Fall. Baker. Laguna Beach, Cal. Black. Shiny. Oval shaped. $1\frac{1}{2}$ mm x 1 mm.

Claremont-Laguna Diptera from the Collections of the Department of Zoology of Pomona College

Compiled by WALTER STURGIS.

This list gives the first determinations of specimens collected in this region. No attempt has yet been made to bring all the names up to date or to add more recent records.

OESTRIDÆ

Gastrophilus equi Clark. —. Baker. Claremont, Cal.

SARCOPHAGIDÆ

Sarcophaga haemorrhoidalis Meigen. Parker. Baker. Claremont, Cal., and mountains near.

Helicobia helici Towns. Coq. Baker. Claremont, Cal.

Ravinia latisetosa Parker. Parker. Baker. Claremont, Cal.

Böttcheria cimbicis Towns. Parker. Baker. Claremont, Cal.

Ravinia communis Parker. Parker. Baker. Claremont, Cal.

Microchetina cineria Wulf. Coq. Baker. Claremont, Cal.

DELIIDÆ

Thelaira mexicana Maquart. —. Baker. Claremont, Cal.

Myrocera tibialis Desvoidy. —. Baker. Claremont, Cal.

DOLICHOPODIDÆ

Dalichophus crenatres Osten-Sacken. —. Baker. Mountains near Claremont, Cal.

Dolichophus afflictus Osten-Sacken. —. Baker. Laguna Beach, Cal.

PHORIDÆ

Trineura velutina Meigen. Aldrich. Baker.

LONCHOPTERIDÆ

Lonchopteridæ lutea Panzer. —. Baker.

PIPUNCULIDÆ

Chalarus spurius Fall. Aldrich. Baker.

CONOPIDÆ

Phsychocephala offinis Williston. Coq. Baker. Claremont, Cal.

Occemya baroni Williston. —. Baker. Claremont, Cal., and mountains near.

Occemya abbreviata Loew. Aldrich. Baker. Claremont, Cal., and mountains near.

Myopa pictipennis Williston. Coquil. Baker. Claremont, Cal.

Myopa clausa Loew. Baker. Osten-Sacken. Claremont, Cal.

Zodion obliquefaciatum Osten-Sacken. —. Baker. Claremont, Cal.

Zodion fulvifrons Lay. Coquil. Baker. Claremont, Cal.

Dalmannia vitiosa Loew. Aldrich. Baker. Claremont, Cal.

Dalmannia picta Coquil. Coquil. Baker. Claremont, Cal.

ORTALIDÆ

Diacrita costalis Gerstaecker. Bezzi. Baker. Claremont, Cal.

Anacompta latiuscula Lev. —. Baker. Claremont, Cal.

Chrysomya demandata Fab. Aldrich. Baker. Claremont, Cal.

Chetopsis aenea Wiedemann. —. Baker. Laguna Beach, Cal.

ASILIDÆ

Lestomyia sabulorum Osten-Sacken. Coquil. Baker. Claremont, Cal.

Lestomyia fraudeger Williston. Coquil. Baker. Claremont, Cal.

Nicoles abdominalis Williston. Coquil. Baker. Mountains near Claremont, Cal.

Lasiopogon vivitatus Loew. —. Baker. Claremont, Cal.

Leptogaster virgatus Coquil. —. Baker. Mountains near Claremont, Cal.

Scleropogon jubatus Coquil. —. Baker. Claremont, Cal.
Stenopogon albibasis Bigelow. —. Baker. Claremont, Cal.
Stenopogon californiae Walker. Coquil. Baker. Claremont, Cal.
Stenopogon obscuriventris Loew. Coquil. Baker. Claremont, Cal.
Saropogon luteus Coquil. Coquil. Baker. Claremont, Cal.
Tolmenus notatus Wiedemann. —. Baker. Claremont, Cal.
Erax subius Williston. —. Baker. Claremont, Cal.
Erax albibarbis Macquart. Coquil. Baker. Claremont, Cal.
Asilus occidentalis Hine. —. Baker. Claremont, San Antonio Canyon, Ontario, Cal.
Mallophora faultrix Osten-Sack. —. Baker. Claremont, Cal. Laguna Beach.
Mallophora megachile Coquil. Coquil.? Baker. Mountains near Claremont, Cal.
Dasyllus astur Osten-S. —. Baker. Claremont, Cal.

BOMBYLIIDÆ

Exoptota divisa Coquil. Coquil. Baker. Claremont, Cal.
Spongostylum simson Fabricius. —. Baker. Mountains near Claremont, Cal.
Spongostylum varia Fab. —. Baker. Mountains near Claremont, Cal.
Exoprosopa titubans Osten-S. —. Baker. Mountains near Claremont, Cal.
Anthrax alpha Osten-S. —. Baker. Claremont and mountains near.
Anthrax syrtus Coquil. Coquil. Baker. Claremont, Cal.
Anthrax nugator Coquil. Coquil. Baker. Claremont, Cal.
Anthrax sabulosa Coquil. Coquil. Baker. Claremont, Cal.
Anthrax agrippina Osten-S. Coquil. Baker. Claremont, Cal., and mountains near.
Anthrax sinuosa Wiedemann. —. Baker. Mountains near Claremont, Cal.
Anthrax morio Loew. —. Baker. Mountains near Claremont, Cal.
Anthrax lateralis Say. —. Baker. Claremont, Cal.
Anthrax mira Coquil. —. Baker. Claremont, Cal.
Anthrax junctura Coquil. —. Baker. Claremont, Cal.
Anthrax miscella Coquil. —. Baker. Claremont, Cal.
Anthrax consessor Coquil. Coquil. Baker. Claremont, Cal.
Pantarbes capets Loew. —. Baker. Claremont, Cal.
Phthiria notata Loew. —. Baker. Claremont, Cal.
Phthiria sulphurea Loew. —. Baker. Claremont, Cal.
Phthiria simile Coquil. —. Baker. Mountains near Claremont, Cal.
Bombylius major Loew. Coquil. Baker. Mountains near Claremont, Cal.
Bombylius lancifer Osten-S. Coquil. Baker. Claremont, Cal.
Bombylius albicapillus Loew. Coquil. Baker. Claremont, Cal.
Toxophora pellucida Coquil. —. Baker. Mountains near Claremont, Cal.
Geron semlis Fab. —. Baker. Mountains near Claremont, Cal.
Alphobautus transitus Coquil. —. Baker. Claremont, Cal.
Eclinus auripilus Bigot. —. Baker. Claremont, Cal.
Ploas atratula Loew. —. Baker. Claremont, Cal.
Ploas melanocera Bigot. —. Baker. Claremont, Cal.
Epacmus modestus Loew. —. Baker. Claremont, Cal.
Exoprosopa fascipennis Say. —. Baker. Mountains near Claremont.
Lordotus planus Osten-S. —. Baker. Claremont, Cal.

CULICIDÆ

Culex quinquefasciatus Say. —. Baker. Claremont, Cal.
Culex inornatus Williston. —. Baker. Claremont, Cal.

BIBIONIDÆ

Dilophus breviceps Loew. Coquil. Baker. Catalina Island, Cal.
Dilophus occipitalis Coquil. Coquil. Baker. Claremont, Cal.
Bibio hirtus Loew. —. Baker. Claremont, Cal.
Bibio albipennis Say. Coquil. Baker. Claremont, Cal.

THEREVIDÆ

Psilocephala aldrichii Coquil. Coquil. Baker. Claremont, Cal., and mountains near.
Nebritus pellucidus —. Aldrich. Baker. Claremont, Cal.
Psilocephala baccata Coquil. Coquil. Baker. Claremont, Cal., and mountains near.
Psilocephala costalis Loew. Aldrich. Baker. Claremont, Cal., and mountains near.
Psilocephala levigata Loew. —. Baker. Claremont, Cal., and mountains near.
Psilocephala marcida Coquil. —. Baker. Laguna Beach; Claremont, Cal.

ACROCETIDÆ [Cytridæ]

- Opsebius diligens* Loew. Aldrich. Baker. Claremont, Cal.
Eulonchus smaragdinus Gerstaecker. Coquil. Baker. Claremont, Cal.
 SYRPHIDÆ
Chrysotoxum laterale Loew. —. Baker. Mountains near Claremont, Cal.
Paragus tibialis Fall. —. Baker. Claremont, Cal.
Chrysogaster nitida Wied. Coq. Baker. Claremont, Cal., and mountains near.
Chrysogaster nigripes Loew. —. Baker. Claremont, Cal.
Nausigaster unimaculata Townsend. Aldrich. Baker. Claremont, Cal.
Melanostoma stegnum Say. —. Johnson. Claremont, Cal.
Syrirta pipiens Linné. —. Baker. Claremont, Cal.
Lasiophthicus pyrastris Linné. —. Baker. Mountains near Claremont, Cal.
Eupeodes volucris Osten-S. Aldrich. Baker. Claremont, Cal.
Mesogramma marginata [Or *Syrphus quintus*] Say. —. Baker. Claremont, Pine Lake; California.
Allograpta obliqua Say. Aldrich. Baker. Claremont, Cal.
Allograpta fracta Osten-S. Aldrich. Baker. Claremont, Cal.
Sphaerophoria sulphuripes Townsend. —. Baker. Claremont, Cal.; Pine Lake.
Syrphus arcuatus Fall. Aldrich. Baker. Claremont, Cal.
Syrphus mentalis Will. —. Baker. Seattle, Washington; Claremont, Cal.
Syrphus americanus Wiedemann. Aldrich. Baker. Claremont, Cal.
Syrphus opinator Osten-S. Aldrich. Baker. Mountains near Claremont, Cal.
Mallota sackeni Williston. —. Baker. Claremont, Cal.
Specomyia brevicornis Osten-S. —. Baker. Claremont, Cal.
Copestylus marginatum Say. Coquil. Baker. Mountains near Claremont.
Volucella mexicana Macquart. —. Baker. Mountains near Claremont, Cal.
Volucella avida Osten-S. —. Baker. Claremont, Cal.
Eristalis hirtus Loew. —. Baker. Mountains near Claremont, Cal.
Eristalis latifrons Loew. Loew. Baker. Claremont, Cal.
Eristalis tenax Loew. —. Baker. Laguna Beach, Cal.
Asemosyrphus mexicanus Macquart. —. Baker. Mountains near Claremont, Cal.
Helophilus latifrons Loew. —. Baker. Claremont, Cal.
Spilomyia interrupta Williston. —. Baker. Mountains near Claremont, Cal.
Criorhina coquilleti Williston. Aldrich. Baker. Claremont, Cal.

MUSCIDÆ

- Calliphora erythrocephala* Meigen. Coquil. Baker. Claremont, Cal.
Chrysemia nigripes Wheeler. Aldrich. Baker. Mountains near Claremont, Cal.
Phormia regina Meigen. —. Baker. Claremont, Cal., and mountains near.
Pseudopyrellia cornicina Fab. —. Baker. Pine Lake, Claremont, Cal.
Lucilia sericata Meigen. Coquil. Baker. Claremont, Cal.
Myiospila mediatubunda Fab. Aldrich. Baker. Mountains near Claremont; Visalia, Cal.
Musca domestica Linné. —. Baker. Claremont, Cal.
Hæmatobia serrata Desvoidy. —. Baker. Claremont, Cal.
Muscina stabulans Fall. —. Baker. Laguna Beach, Cal.

TACHINIDÆ

- Ravinia setosa* Coquil. Aldrich. Baker. Claremont, Cal.
Ravinia communis Park. Aldrich. Baker. Claremont, Cal.
Ravinia dentata Coquil. Aldrich. Baker. Mountains near Claremont, Cal.
Frontina archippivora Williston. Aldrich. Baker. Mountains near Claremont, Cal.
Senotainia trilineata Coquil. Aldrich. Baker. Claremont, Cal.
Hilarella siphonina Zetter. Aldrich. Baker. Mountains near Claremont, Cal.
Melanophrys flavipennis Williston. Aldrich. Baker. Claremont, Cal.
Belvosia bifasciata Fab. Aldrich. Baker. Mountains near Claremont, Cal.
Exorista affinis Fall. Aldrich. Baker. Mountains near Claremont, Cal.
Sturmia ocellaris Coquil. Aldrich. Baker. Claremont, Cal.
Plagia americana Loew. Aldrich. Baker. Claremont, Cal.
Aphrya ocypterata Townsend. Aldrich. Baker. Claremont, Cal., and mountains near.
Leucostonia senilis Townsend. Aldrich. Baker. Claremont, Cal.
Pachyophthalmus signatus Meigen. Aldrich. Baker. Mountains near Claremont, Cal.

Ocyptera caroline Desvoidy. Aldrich. Baker. Claremont, Cal.
Masicera exilis Coquil. Aldrich. Baker. Mountains near Claremont, Cal.
Trichopoda pennipes Fab. —. Baker. Claremont, Cal., and mountains near.
Echinomyia hyptrix Fab. Aldrich. Baker. Mountains near Claremont.
Echinomyia hystricosa Williston. Aldrich. Baker. Claremont, Cal.
Phoranthia occidentalis Walker. —. Baker. Claremont, Cal.
Senotainia trilineata Vander Wulp. —. Baker. Laguna Beach, Claremont, Cal.
Fachyophthalmus floridensis Townsend. —. Baker. Mountains near Claremont, Cal.
Siphosturmia rostrata Coquil. —. Baker. Claremont, Cal.
Xanthomelena arcuata Say. —. Baker. Claremont, Cal., and mountains near.
Blephanpeza leucophrys Wiedemann. Aldrich. Baker.
Clausicella setigera Thomson. Aldrich. Baker. Laguna Beach, Cal.
Siphona plusie Coquil. Aldrich. Baker. Claremont, Cal.
Metacheta nelymus Walker. Aldrich. Baker. Claremont, Cal.
Admontia —. —. —. Claremont, Cal.
Plagiospherysa parvipalpis Van der Wulp. —. Baker. Laguna Beach, Cal.
Gonia capitata DeGeer. —. Baker. Claremont, Cal.
Peleteria robusta Wiedemann. Coquil. Baker. Claremont, Cal., and mountains near.
Peleteria tessellata Fab. Aldridge. Baker. Claremont and mountains near.
Paradejeania rutiloides Jaennicke. —. Baker. Mountains near Claremont, Cal.
Epalpus signifera Walker. Coquil. Baker. Mountains near Claremont, Cal.

ANTHOMYIDÆ

Aricia lucorum Fall. Aldrich. Baker. Claremont, Cal.
Phaonia burnmeineris Stein. —. Baker. Mountains near Claremont, Cal.
Phorbia fusciceps Setters. —. Baker. Claremont, Cal.
Phorbia offinis Stein. —. Baker. Mountains near Claremont, Cal.
Phorbia cinerella Fall. —. Baker. Mountains near Claremont, Cal.
Pegomyia offinis Stein. —. Baker. Laguna Beach, Cal.
Caricia nana Zettters. —. Baker. Laguna Beach, Cal.
Fucellia ruftibia Stein. Aldrich. Baker. Laguna Beach, Cal.
Hylemyia alcathoe Walker. —. Baker. Laguna Beach, Cal.
Phorbia cilicrura Rondani. Aldrich. Baker. Mountains near Claremont, Cal.

TABANIDÆ

Tabanus punctifer Osten-S. Hine. Baker. Claremont, Cal.
Tabanus opacus Coquil. Coquil. Baker. Mountains near Claremont, Cal.

MYDAIDÆ

Midas claratus Drury. —. —. Claremont (?) Cal.
Leptomydas concinnus Coquil. Coquil. Baker. Claremont, Cal.
Leptomydas nirtus Coquil. Coquil. Baker. Claremont, Cal.

SAPROMYZIDÆ

Lonchæa polita Say. —. Baker. Claremont, Cal., and mountains near.
Sapromyza livingstonii Coquil. —. Baker. Mountains near Claremont, Cal.
Sapromyza planiscuta Thomson. —. Baker. Pine Lake, Claremont, Cal.
Sapromyza notata Fall. —. Baker. Mountains near Claremont, Cal.
Sapromyza flaveola Coquil. Aldrich. Baker. Laguna Beach, Cal.
Sapromyza fraterna Loew. Aldrich. Baker. Laguna Beach, Cal.

AGROMYZIDÆ

Desmometopa halteralis Coquil. —. Baker. Claremont, Cal.
Desmometopa m-nigrum Zettters. —. Baker. Claremont, Cal.
Sinophthalmus pictus Coquil. Coquil. Baker. Mountains near Claremont, Cal.
Leucopis nigricornis Egger. Coquil. Baker. Mountains near Claremont, Cal.
Leucopis bella Loew. Aldrich. Baker. Claremont, Cal.
Rhincæssa coronata Loew. Aldrich. Baker. Claremont, Cal.
Cryptæhetum iceryæ Williston. Aldrich. Baker. Claremont, Cal.

DROSOPHILIDÆ

Drosophila frunbris Fab. Coquil. Baker. Claremont, Cal.

BORBORIDÆ

Borborus equinus Fall. —. Baker. Mountains near Claremont, Cal.

PHYCODROMIDÆ

Cælope frigida Fall. Aldrich. Baker.

GEOMYZIDÆ

Scyphella flava Linné. —. Baker. Laguna Beach, Cal.

TRYPETIDÆ

Trypeta occidentalis Snow. —. Baker. Claremont, Cal.

Trypeta ochilleæ Johnson. —. Baker. Mountains near Claremont, Cal.

Oedaspus minuta Snow. Coquil. Baker. Claremont, Cal.

Rhagoletis caurina Doane. Coquil. Baker. Claremont, Cal.

Eatrata sparsa Weidemann. Aldrich. Baker. Laguna Beach, Cal.

Neaspilota signifera Coquil. Aldrich. Baker. Claremont, Cal.

Euaresta bella Loew. —. Baker. Mountains near Claremont, Cal.

Euaresta abstersa Loew. —. Baker. Laguna Beach, Cal.

Euaresta æqualis Loew. —. Baker. Laguna Beach, Cal.

Euaresta araneosa Coquil. —. Baker. Claremont, Cal.

Urellia occidentalis Adams. —. Baker. Claremont, Cal.

Urellia bisetosa Coquil. Johns. Baker. Claremont, Cal.

Urellia maverina Walker. —. Baker. Claremont, Catalina Island, Cal.

Tephritis gemella Coquil. —. Baker. Claremont, Cal.

Tephritis finalis Loew. Bezzi. Baker. Claremont, Cal.

Corphotricha culta Wiedemann. Aldrich. Baker. Claremont, Cal.

Ensina humilis Loew. —. Baker. Laguna Beach, Cal.

Epochra rubida Coquil. Bezzi. Baker. Mountains near Claremont, Cal.

OSCINIDÆ

Meromyza americana Fitch. —. Baker. Claremont, Cal.

Chlorops rubida Coquil. —. Baker. Mountains near Claremont, Cal.

Chlorops assinilis Macquart. Aldrich. Baker. Laguna Beach, Cal.

SCIOMYZIDÆ

Sepedon fuscipennis Loew. —. Baker. Mountains near Claremont, Cal.

HELOMYZIDÆ

Helomyza limbata Thomson. Aldrich. Baker. Claremont, Cal., and mountains near.

Levia —. —. Baker. Claremont, Cal., and mountains near.

EPHYDRIDÆ

Mosillus æneus Fall. —. Baker. Mountains near Claremont, Cal.

Mosillus subsultans Fab. Aldrich. Baker. Claremont, Cal.

Ochthera mantis DeGeer. —. Baker. Mountains near Claremont, Cal.

Pelina brevis Walker. —. Baker. Mountains near Claremont, Cal.

Notiphila quadrisetosa Thomson. Aldrich. Baker. Laguna Beach, Cal.

Parydra aurata Jones. Aldrich. Baker. Mountains near Claremont, Cal.

SIMULIIDÆ

Simulium vittatum Zettters. Aldrich. Baker. Mountains near Claremont, Cal.

LEPTIDÆ

Leptis pruinosa Bigot. Aldrich. Baker. Claremont, Cal.

Leptis punctipennis Say. —. Baker. Compton, Cal.

Leptis mystacea Macquart. —. Baker. Ocean Co., Cal.

Symphoromyia cruenta Coquil. Coquil. Baker. Claremont, Cal.

STRATIOMYIDÆ

Sargus viridis Say. Aldrich. Baker. Claremont, Cal.

Stratiomys maculosa Loew. Coquil. Baker. Claremont, Cal.

Odontomyia binotata Loew. Aldrich. Baker. Claremont, Cal.

Nemotelus canadensis Loew. Coquil. Baker. Claremont, Cal.

Euparypus apricalis Coquil. —. Baker. Laguna Beach, Cal.

EMPIDIDÆ

Rhamphomyia biflata Coquil. Coquil. Baker. Claremont, Cal.

Rhamphomyia fimbriata Coquil. Coquil. Baker. Claremont, Cal.

Rhamphomyia scutellaris Coquil. Coquil. Baker. Mountains near Claremont, Cal.

Rhamphomyia loripedis Coquil. Coquil. Baker. Claremont, Cal.

Platypolpus æqualis Loew. Aldrich. Baker. Claremont, Cal.

CORDYLURIDÆ [or Scatophagidæ]

Scatophaga stercoriaria Linné. —. Claremont, Cal.

Isopods from the Claremont-Laguna Region

ANTHURIDÆ

Cyathura sp. A number collected with eggs. Specimens have been sent for further identification.

CIROLANIDÆ

Cirrolana harfordi Lock. One of the most common isopods in tide pools and under stones.

C. h. var. spongicola Staf. Found in white sponge masses.

LIMNORIIDÆ

Limnoria lignorum Rath. Found in floating wood which also contained a number of Tereido.

DYNAMENIDÆ

Dynamene glabra Rich. Common at low tide.

Cilicea cordata Rich. One dredged 10 fathoms.

C. gilliana Rich. One very near to this species dredged at from 10 to 15 fathoms.

C. caudata Say. Near this, but not quite the same.

C. sculpta Holmes.

SEROLIDÆ

Serolis carinata Lock. Two dredged by Bean and Nininger in 1915.

IDOTHEIDÆ

Ideothea gracillima Dana.

I. rectilinea Lock.

Pentidotea recata Stimp. Dredged off shore.

P. rotundata Rich. Pure green from algæ.

P. whitei Stimp. Two specimens in five years.

P. stenops Ben. Laguna one specimen.

Colidotea rostrata Ben. Sea weed. Deep red.

ONISCIDÆ

Porcellio lævis Lat. Common inland under stones.

Philoscia richardsonæ Holmes and Gray.

(Contribution from the Zoological Department of Pomona College.)

A List of Some Additional Shrimp Like Crustacea from Laguna Beach

All specimens were determined by the U. S. Nat. Museum.

Crago nigricauda Stimp. Common bottom shrimp. Dredged and also from the sand flats at Balboa.

C. holmesii Rath. Dredged 10 to 15 f.

C. munitella Walker. Dredged 10 to 15 f.

One was mottled brown with bright red markings along the back.

Another has the whole body a dark slate color.

Another has slate bands and red center of the body.

Another has bands of slate and red alternating.

C. alba Holmes. White dotted with black. Dredged.

Spirontocaris palpator Owen. Dredged. Body streaked with brownish, legs bright spotted. Another, appendages deep pink, body violet. Another body with a light pink tinge.

S. picta Stimp. Dredged.

S. franciscana Schmitt. Plain pale reddish brown. Dredged.

S. carinata Holmes. Dredged 10 to 15 f. Large bright green shrimp.

Crangon dentipes Guerin. Claws greenish, body pale. Shore at low tide.

C. equidactylus Lock. In kelp holdfast at Salt Creek. Red cross lines in each segment.

Hippolyte californiensis Holmes. Abundant on eel grass, Balboa Bay.

HERMIT CRABS

Paguristes ulreyi Schmitt. Large hermit crab dredged in 1917.

Holopagurus pilosus Holmes. Medium sized, rather free from long hairs, light colored. Dredged.

Parapagurus minimus Holmes. These narrow little hermit crabs were found living in the hollowed out bits of roots of eel grass. They were a dark red brown in life. Dredged at from 10 to 15 f.

W. A. H.

(Contribution from the Zoological Department of Pomona College.)



Some Amphipods Collected During the Summer of 1916 at Laguna Beach

M. SHAW

A number of other specimens have been sent away for identification

LYSSIANASSIDÆ

Nannonyx dissimilis Stout.

Ampelisca articulata Stout.

GAMMARIDÆ

Caliniphargus sulcus Stout.

Maera simile Stout.

TALITRIDÆ

Orchestoidea californiana Brandt.

Orchestia traskiana Stimp.

Hyallega azteca Sauss.

Allorchestes frequens Stout.

A. oculatus Stout.

PODOCERIDÆ

Dulchiella spinosa Stout.

PHOTIDÆ

Photis californica Stout.

AMTHITHOIDÆ

Amphithoe corallina Stout.

Acanthogrubia uncinata Stout.

(Contribution from the Zoological Department of Pomona College.)

Crabs Taken at Laguna Beach in the Summer of 1916

H. H. NININGER

Drawings by John Coffman. Determinations by the U. S. Nat Museum.

While enjoying the pleasant surroundings at Laguna Beach in the summer of 1916, it was my pleasure to make a brief and partial survey of the crabs of that region. In this paper it is intended to give a description of those species taken which may be of use to students who, in the future, may choose to carry on this line of work. The drawings are intended to represent accurately only the outline of form as viewed from the dorsal side. No attempt is made to indicate pubescence (except in a few cases) or irregularities of surface which would require shading.

Heterocrypta occidentalis Dana

This species which was reported by Prof. Hilton from Hermosa Beach in the summer of 1915, was found in abundance directly off Laguna bathing beach in 12-20 fathoms of water. Fig. 1 represents an adult male.

Portunus xantusii (Stimpson)

These very interesting crabs were taken quite frequently in water of 10-15 fathoms. Fig. 2 is of an adult male.

Cancer gracilis Dana

Only the young of this species were taken; 5-10 fathoms of water. Fig. 3.

Cancer gibbosulus (De Horn)

Fig. 4 shows the only specimen taken, a young one.

Cancer productus Randall

The only specimen taken was a young one. Fig. 5 outlines the carapace. About 15 fathoms.

Cancer jordani Rathbun

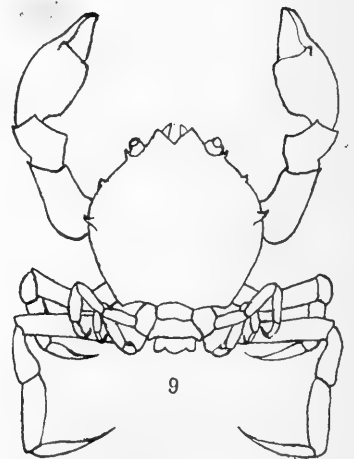
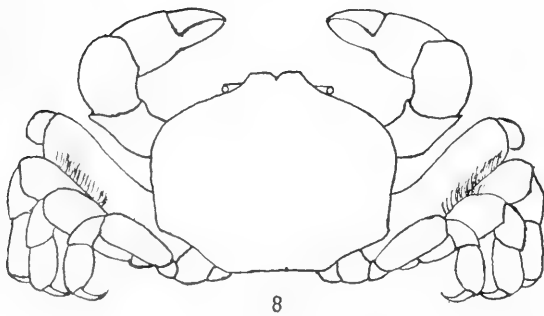
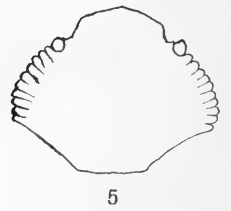
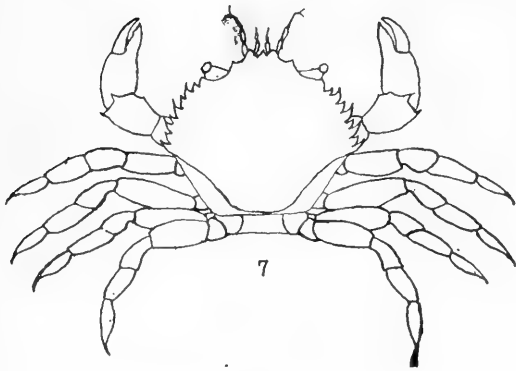
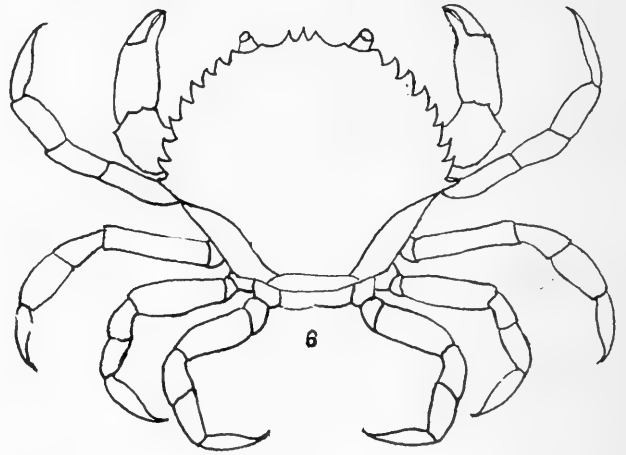
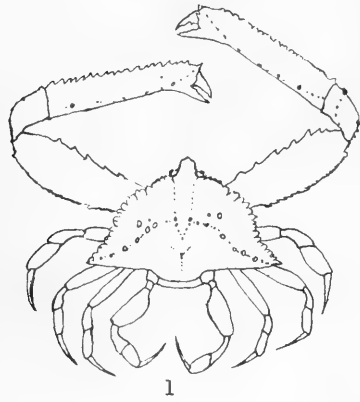
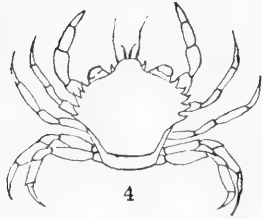
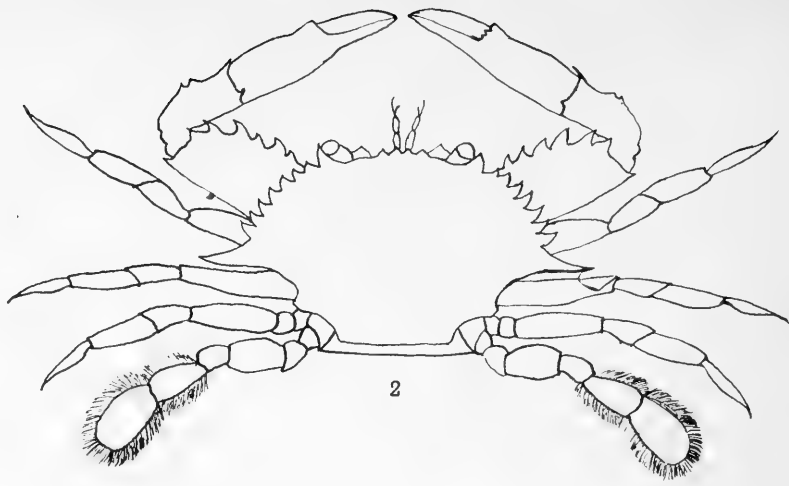
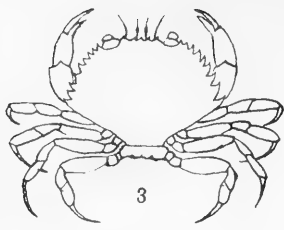
Scores of these were taken by dredging. Fig. 6 shows an adult female. The sexes are much alike. They are covered by a rather dense coat of somewhat flexible hairs. The carapaces of the young vary greatly in color. Adults are generally mottled with reddish brown on carapace and legs. Fig. 7 is of a young specimen.

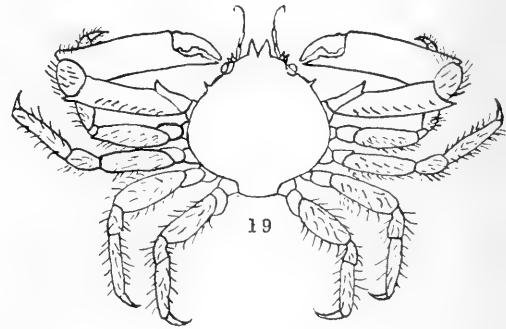
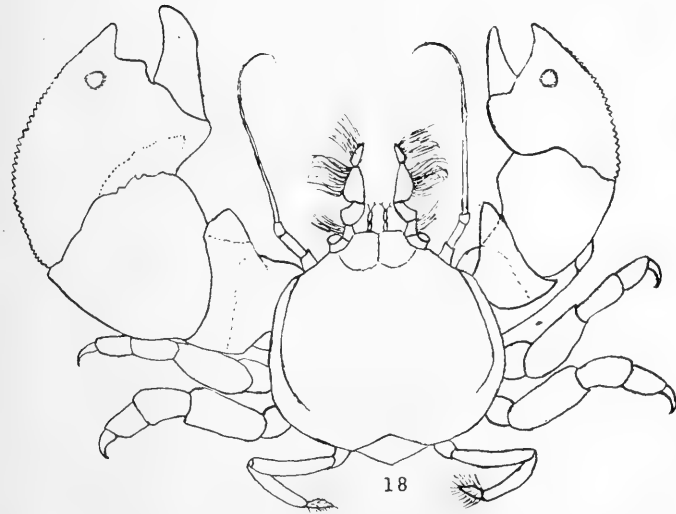
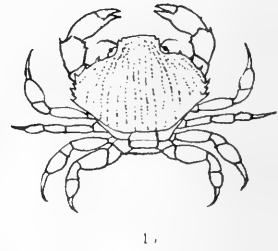
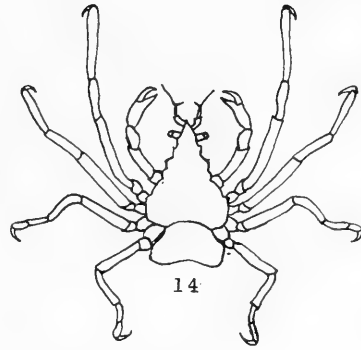
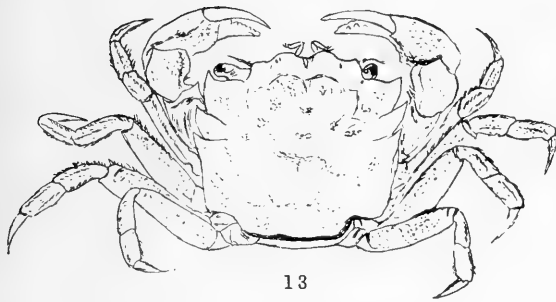
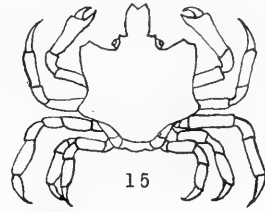
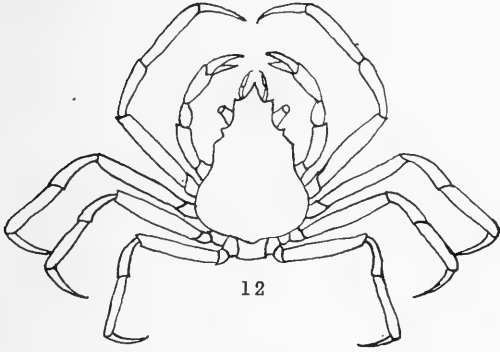
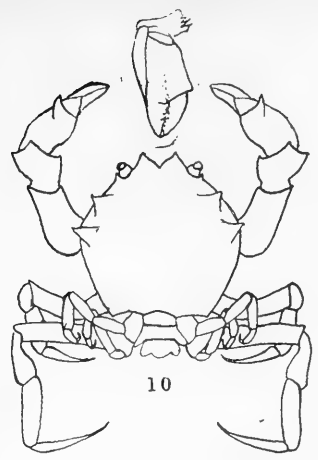
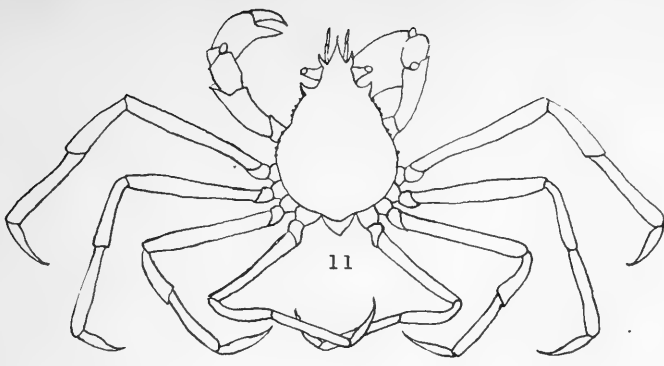
Opisthopus transversus Rathbun

Though small, this is certainly one of our most beautiful species. The carapace richly spotted with vermilion to deep red, is polished almost to pearly smoothness. Only a few of these were obtained. Fig. 8 illustrates an adult. 10-20 fathoms.

Clythrocerus plana Rathbun

Though they could lay no claim to such beauty as the last named species, these crabs surely received their full share of attention in the aquarium. They persist in carrying about upon their backs pieces of shell, pebbles, sticks, fragments of seaweed, or entire shells with their living contents and seem much embarrassed without some such covering. When placed in a glass dish where nothing else was available, one seized a snail shell more than twice its own size and seemed perfectly content when it had this firmly gripped upon its back. They are found in 15-20 fathoms of water on gravel and shell beds. The two rear pairs of legs are peculiarly modified into





upturned hooks for gripping objects carried on their backs. And the dorsal surface of the carapace is reduced to a plane. Figs. 9 and 10.

Inachoides magdalenensis Rathbun

But few of these were taken. They are not so much given to decoration as some others of the Spider Crabs. We found them in 12-15 fathoms of water. The carapace and legs are set with numerous clumps of stiff hooked hairs. Figs. 11 and 12 represent male and female respectively.

Hemigrapsus oregonensis (Dana)

This species was found in abundance on the mud flats at Balboa. One specimen was dredged at from 12-15 fathoms, probably carried out by the current from the bay. Fig. 13.

Podochela hemphilli (Lockington)

This species was fairly common among the masses of red seaweed dredged from a depth of 10-20 fathoms. They are marked with reddish brown, but are always so covered over with decorative fragments of seaweed that even their form is almost indistinguishable. In the aquarium these creatures were very interesting. Their principal occupation was that of the decorating of themselves. Seizing a fragment near one end, that end was thrust into the mouth and chewed for some time, then transferred to some part of the carapace or legs, and by means of a peculiar and oft repeated twisting movement of the hand it was so firmly fastened that it would under almost all circumstances remain in the position in which it had been placed. The chewing led us to suspect a cementing element in the saliva, but on examination of the carapace it was found that each piece of seaweed was impaled on several of the stiff recurved hairs which occur in clumps over the carapace and legs. Fig. 14 represents an adult female carrying eggs.

Epialtus bituberculatus Milne Edw.

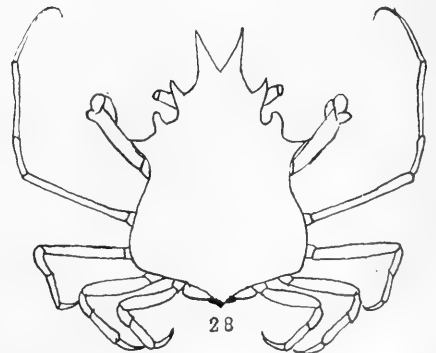
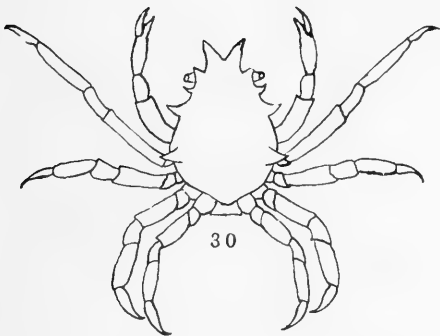
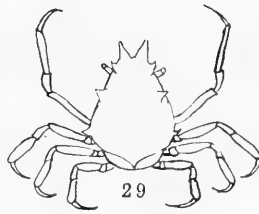
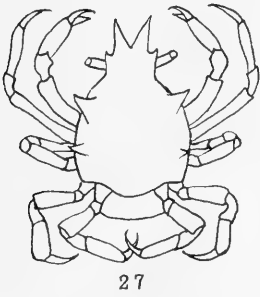
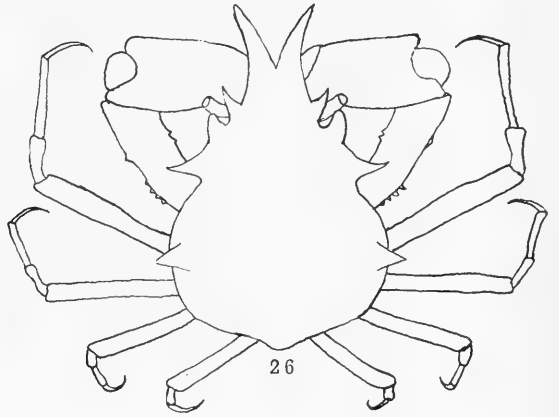
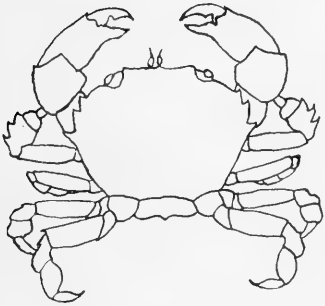
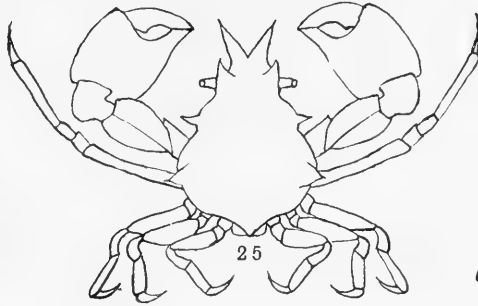
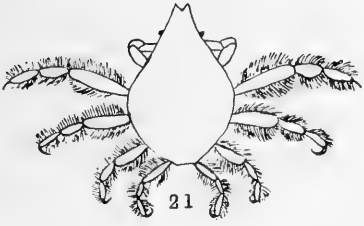
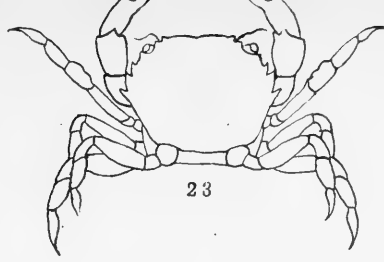
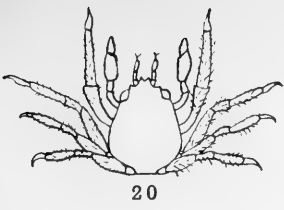
Only two were taken during the summer. Fig. 15 is from a male specimen.

Cycloxanthops novemdentatus Lock

A better idea of the adult of this species can be obtained by consulting Dr. Hilton's paper in this journal for June, 1916. In Fig 16, a and b, show some of the many very striking and deceptive variations which occur in the young. The dotted lines show the distribution of red pigment in the almost clear white carapaces of these two specimens. It gives them a very unusual appearance for the usual color is a uniform dull brown (sometimes purplish) with black claws. These crabs may be found at medium low tide by tearing apart the rocks which have been cemented together by marine worms, mollusks, etc. The carapace of an adult male measured more than eight cm. in width.

Pachycheles holosericus Schmitt

Whatever respect Nature has for proportion and symmetry must have been laid aside while this species was being formed. It is indeed hard to imagine a more awkward looking pair of chelipeds than it possesses. Yet it seems to handle them with some degree of success. They serve as an efficient means of protection of the nature of a lid for the cavities in sponges, stones, etc., in which these crabs are usually



found. The chelipeds are very rough and the organic growth which covers them renders them difficult to detect from the surroundings. Fig. 18 gives a good idea of their form.

P. rudis Stimp.

This has the right claw large.

Herbstia parvifrons Rand

Only three, two adults and one young, of these were taken during the summer, but on a visit to the same beach in November I found them very numerous under stones at medium low tide. All were young, however. Figs. 19 and 20 show the adult male, and young.

Pelia clausa Rath.

Fig. 21 shows an adult with legs extended, a position in which it is seldom found. These sluggish creatures live under stones at low tide and if found at all usually have their legs closely folded to them. The entire animal is covered by a dense coat of organic growth.

Lophopanopeus leucomanus Lock.

This species mentioned in Prof. Hilton's paper is figured herewith. Fig. 22 is an adult female. Fig. 23 is young. This species, though generally of a uniform dull brownish color, shows in the young many variations. The carapace is often marked with blackish or white patches of various patterns. Fig. 24 is illustrative of this. Within the dotted lines was very dark pigment, while the lateral patches were almost white.

Pugettia dalli Rath.

Common in 5-20 fathoms. This species exhibits great variation as is shown by the accompanying figures. Figs. 25 and 26 are adult males. Figs. 27 and 28 are adult females. They vary greatly in color and are generally decorated more or less. Fig. 29 illustrates a specimen which was determined, by the U. S. Museum, as a variety of this species. The carapace of *P. dalli* is always set with stiff recurved hairs, of which there are two rows on the rostral spines and other scattered singly or in groups over the carapace and legs.

Pugettia richii Dana

Fig. 30 represents an adult female. But few of these were taken.

Pinnixa longipes Lock.

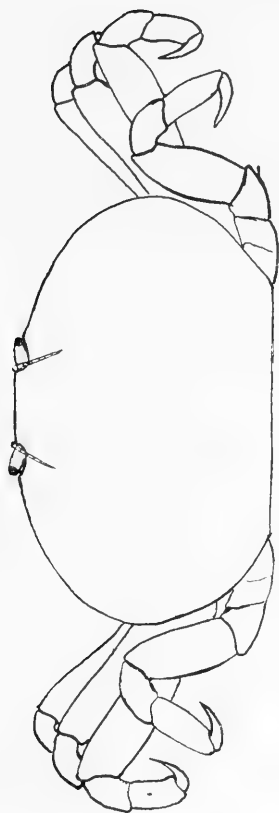
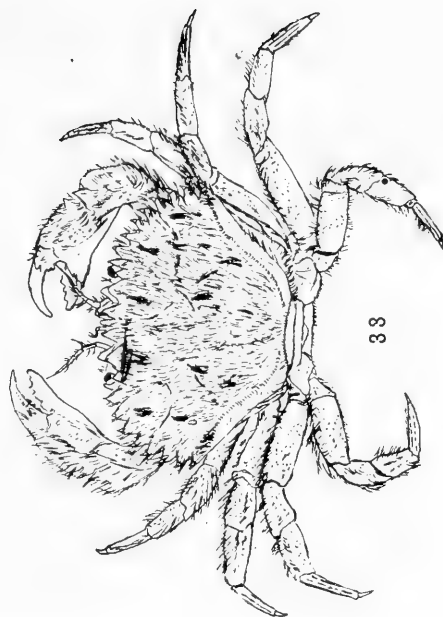
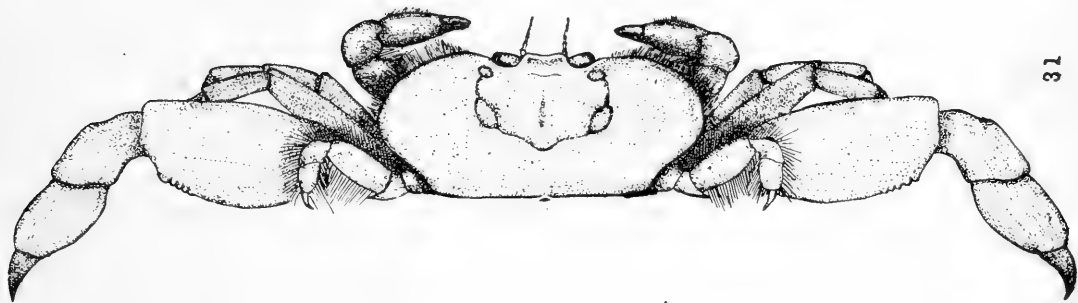
This very odd looking little crab inhabits the sand tubes of *Clymenella*, which are very abundant on the sand bars exposed at low tide near the outlet of Balboa Bay. One or two of the crabs were found in almost every tube examined which contained a worm. The very peculiar form into which this species has developed, as shown in Fig. 31, fits admirably for this commensal life.

Pinnixa littoralis Holmes

The only specimen was an imperfect one shown in Fig. 32. It was found clinging to the outside of the slime tube of *Cerianthus* in Balboa Bay.

Cancer antennarius Stimp.

Fig. 33 represents a young specimen, 4 cm. in width. The hairiness of the carapace is in marked contrast to the smooth condition of adults. Drawn by Esther Funk.



Connections Between Nucleus and Cytoplasm

WILLIAM A. HILTON

While looking over some serial sections of a parasitic isopod, *Grapsicephon* of the Family Bopyridæ, I was struck with the appearances which some of the glandular cells presented. Clear connections of nucleus and cytoplasm were found which resembled very closely the conditions described by Stauffacher '10, and Knoll '10.

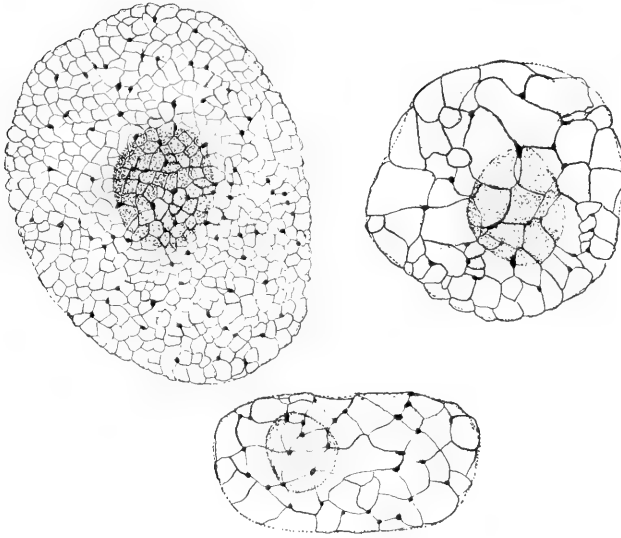
These gland cells are among the largest of the parasite's body and the only ones which presented this appearance. Not all of these gland cells looked alike. There were some that had a rather homogeneous appearance in the cytoplasm and even less detail in the nucleus. The cytoplasm of these gave an acid reaction. Many of the cells showed a decided reticulum which seemed to make up the framework of both nucleus and cytoplasm, or at least this reticulum penetrated into the nucleus. The chromatin granules are not very abundant in the nuclei of these cells, but in a number of places chromatin is found in the cytoplasm attached to the reticulum. Passing from the nucleus to the cytoplasm, or it may be from cytoplasm to nucleus, are granules or masses of basichromatin. In many places these show partly in the nucleus, partly in the cytoplasm. In almost every case the chromatin granules seemed to follow the lines of the reticulum in their migrations.

The figures of Danchakoff '16, appear much like these preparations in places and like the figures of Stauffacher. In the specimens of the former the chromatin is migrating from the cell body to the nucleus. As these gland cells are apparently differentiating for purposes of secretion and not for mytosis it seems probable that the chromatin is leaving the nucleus.

REFERENCES

- Danchakoff, Vera* 1916
Studies on cell differentiation. Jour. morph. vol 27, No. 3.
- Knoll, W.* 1910
Bethehen direkte, mit unseren heutigen Hilfsmitteln darstellbare Verbindungen zwischen Kern und Cytoplasma? Zeit. wiss. zool. xcv Bd. 1. Heft.
- Stauffacher, Hch.* 1910
Beitrage zur Kenntniss der Kernstrukturen. Zeit. wiss. zool. xcv Bd. 1. Heft.

(Contribution from the Zoological Department of Pomona College)



EXPLANATION OF FIGURES

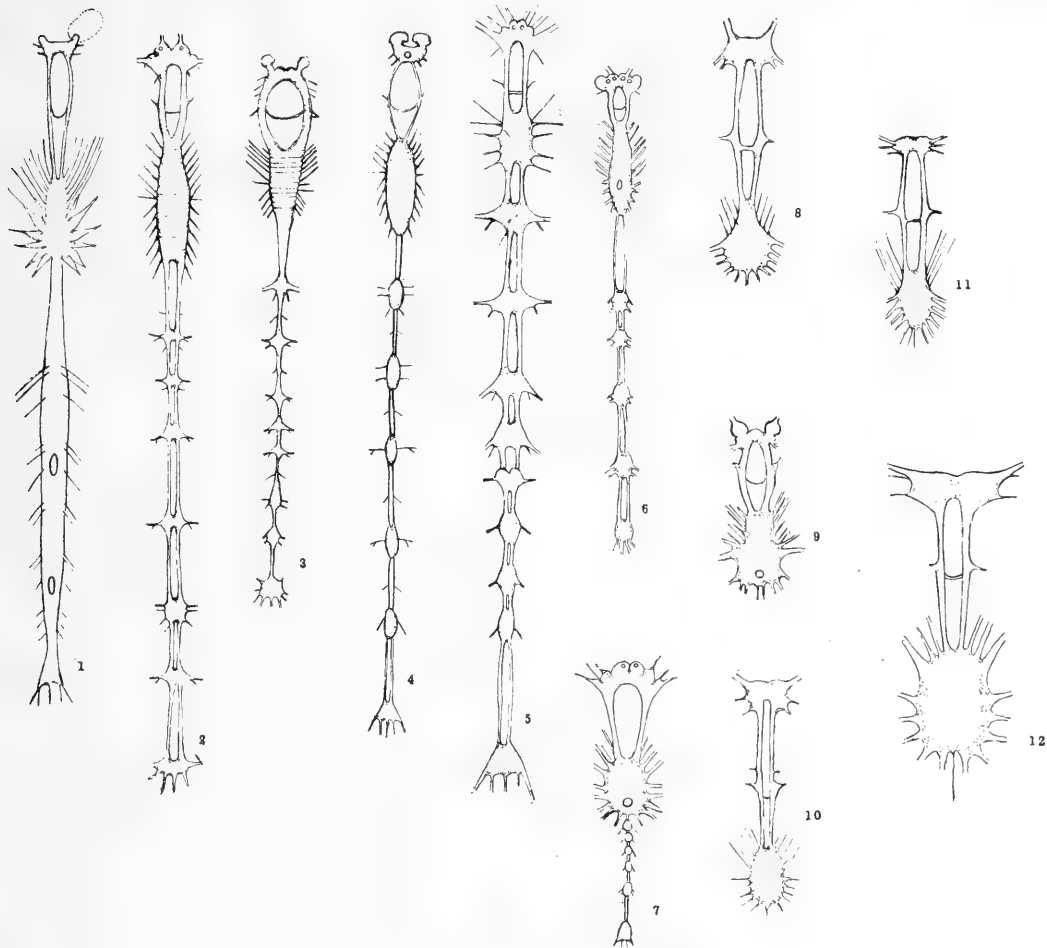
Cells from a grandular structure of the parasitic isopod, *Grapsicephon*. The reticular network besides being found on the surface of the nuclei actually penetrates them as well. The granules on the reticulum within and without the nuclei represent chromatin. This net work in the specimens is of a lighter color than the chromatin; it stains about the same shade as the larger part of the nucleus. The nucleus does not seem to be entirely reticular in structure, but it is so dense and always stains so uniformly that it is impossible to determine. The drawings are X800.

Central Ganglia of Some Decapod Crustacea

WILLIAM A. HILTON

The nervous system of a number of decapod Crustacea from Laguna Beach were dissected and the chief parts sketched. The general distribution the ganglia is much as has been described by Bouvier for similar genera.

All the drawings are enlarged three times. The determinations are from specimens compared with those determined by the U. S. Nat. Mus. at Washington.



Central Ganglia of Decapod Crustacea

- Fig. 1. *Hippolysmata californica* Stimp.
- Fig. 2. *Callinassa longimana* Stimp.
- Fig. 3. *Crago nigricauda* Stimp.
- Fig. 4. *Betæus longidactylus* Lock.
- Fig. 5. *Eremita analoga* Stimp.
- Fig. 6. *Pagurus samuelis* Stimp.
- Fig. 7. *Petrolisthes eriomerus* Stimp.
- Fig. 8. *Pugettia* sp.
- Fig. 9. *Randallia ornata* Rand.
- Fig. 10. *Epialtus productus* Rand. Small specimen.
- Fig. 12. *Xanthias taylori* Stimp.

Notes on the Central Nervous Systems of Holothurians

WILLIAM A. HILTON

A number of attempts were made to stain the central nervous system of *Stichopus* with methylene blue, but without success. Dissections were most successfully made when the animals were fixed in hot mercuric chloride. Specimens injected were filled with the fluid and the whole body was later immersed. Specimens with the body distended were obtained in this way and the nerve trunks were easily followed after the removal of the longitudinal muscle bands. Parts of the nerve trunks were removed and sectioned.

Specimens of *Leptosynapta* were imbedded and sectioned whole and a few young of *Stichopus* were sectioned whole.

Very little difference was noted between radial and circumoral nerves at different places. The general character of the nervous system was very much as found in other echinoderms. The deep nerve bands were not well marked in many of the sections, but groups of cells more or less joined with the superficial trunks were found without difficulty.

In adult *Stichopus* the cells are fairly numerous out in the fibrous area of the superficial band. The radial nerves show a bilateral division as there is often a depression on the inner side which approaches the appearance of a cavity.

In my preparations the cell body is not very distinct from the nucleus. There may be six or more layers of cells at the edge of the outer band. The nerve processes consist of many fine strands running in through the fibrous area, but there seems to be in addition to this a groundwork of material which may in large part be made of fibers and fibrils whose identity could not be discovered.

In the younger specimens of *Stichopus* the fibers were more prominent and the cells in the fibrous area were markedly fewer in numbers. The fibers for the most part seem to run the long way of the nerve trunk. Especially were long strands found in the circumoral ring, although fibers could be seen crossing in considerable numbers as well. In the radial nerves the crossing and interweaving of the nerve fibers as they show in cross section is very intricate.

Small nerve trunks were followed along the tubes of the water vascular system. These were seen to have a similar but simpler structure than the radial nerves.

In *Leptosynapta* a very similar sort of nervous system was found, but the nerve cells were larger and on the whole fewer in number. The deep nerve trunks were but poorly represented.

The fibers from the basal cells show very clearly both in the superficial and the deep nerves and the fibers cross in a complex manner at all levels. There are but few cells scattered in the fibrous area and there is apparently but little ground substance. The fibers stand out more clearly than in *Stichopus*. Possibly more fibers from the outer margin cross near the inner. This may be due to the branching at the ends of the fibers.

Fibers and fibrils are all about the same size in *Stichopus* and *Leptosynapta*. The circumoral nerve ring seems thicker than the radial, but this may in part be due to contraction. The fibers in the circumoral ring seem smaller than in the radial. In all parts there are many crossings of fibers in the fibrous portions at all angles.

Small cells at the bases of tentacles are similar to the radial nerves in structure, but with fewer more flattened cells.

Baudelot, E.

REFERENCES

Etudes generales sur le systeme nerveux contrib. a l' hist. du syst. nerv. des Echinoderms. Arch. zool. exp. vol. i.

Delage et Herouard

Traite de zoologie concrete. Vol. 3, Les Echinoderms.

Hamann, O.

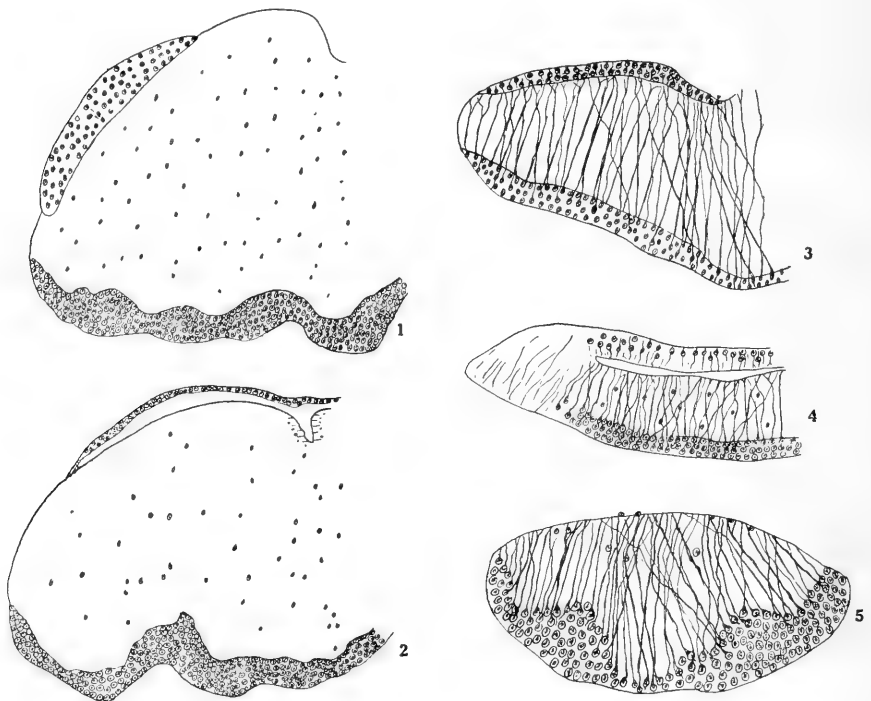
1883

Beitrage zur Histologie der Echinodermen. I Die Holothurien. Zeit. Wiss Zool. vol. 39.

Krohn, A.

1841

Neber die anordnung des Nervensystems der Echiniden und Holothurien im Allgemeinen. Muller Arch. Anat.



Central New System Holothurians

Fig. 1 and 2. Drawings of cross sections of the radial nerve of Stichopus. A little more than one-half of the section is shown. The smaller deep strand is shown on the upper side. X 350.

Fig. 3 and 4. Sections through the radial nerves of a young Stichopus. About one-half of the radial nerves are shown in cross section. X 350.

Fig. 5. Cross section of the radial nerve trunk of Leptosynapta. X 350.

(Contribution from the Zoological Department of Pomona College.)

Coelenterates from Laguna Beach

H. H. NININGER, A. M. BEAN AND OTHERS

Corymorpha palma Torrey. Found at several places on the sand flats near Balboa and Anaheim bays.

Tubularia crocea Ag. Abundant on wharf and piles in Balboa bay.

The only jellyfish which we have had determined is *Scrippsia pacifica* Torrey, Det. Torrey. From surface waters near shore.

Cribina xanthogrammica Brandt, Det. Torrey. The shore anemone is very abundant and variable.

Epiactis prolifera Ver. Specimens of red anemones, brown anemones with red stripes and brown anemones were found under rocks at low tide.

A small sand species was found on the sand flats at Anaheim Landing by W. A. H. in September, 1917. We have not found any at Balboa or at Laguna which seem to be this species.

Edwardsia sp. This was found very abundantly at Balboa bay and Anaheim Landing, in the sand at low tide. W. A. H.

Cerianthus astuari Torrey. Possibly a small specimen collected at Balboa Bay may have belonged to this species. W. A. H.

Cerianthus johnsoni Torrey. Two specimens of this species were collected at Balboa Bay by Nininger. The following is his account of the species:

"The anemone was taken from the muddy shore at low tide. In life the spread of the tentacles was eight and a half inches. There was a folding in toward the mouth of one or more of the tentacles almost all the time. Possibly they were carrying food. In this the tentacles acted independently. When a particle was in the grasp of the group of small central tentacles, the large tentacle or tentacles first involved returned to their former positions at once.

The tube was found to be imbedded in the mud to a depth of sixteen inches. Near the bottom of the tube the anemone was fastened to it by means of a cementing substance much like the inner layers of the tube.

The color of this specimen was pink. The color of another one was grayish with the tentacles banded with pink."

Living in or on the tube of one of these was an adult of the small crab *Pinnixa littoralis* Holmes.

Teleso ambigua Nutting. These little alcyonarians are quite abundant at Laguna Beach, on the under sides of stones.

Psammogorgia torreyi Nutting. Stems of this large branched alconarian were dredged near Balboa in about twenty fathoms by A. M. Bean.

From low tide and from dredging near shore one or possibly two species of stony corals were collected.

Several small anemone-like forms were collected among algæ and among the roots of eel grass. One was a bright red with few tentacles. One had a light body with blue tentacles.

(Contribution from the Zoological Department of Pomona College.)

Notes on Annelids Collected During 1917 at Laguna Beach

A number of sipunculids were collected but not as yet determined. There was one large species found in the sand at Balboa and one small species found in the sand and in a sponge. At Laguna in the roots of eel grass there were two medium sized forms found, one with smooth gray skin, the other with rough brown skin, and one small kind similar to the small one found at Balboa. In a worm colony of *Sabellaria* a rough kind was found which seemed like one of the others.

SYLLIDÆ

Trypanosyllis gemmipara Johnson. Specimens of this large flat syllid were a light pink. Most were obtained by dredging off shore at a depth of from 10 to 15 fathoms. A few were collected from algæ along shore.

Syllis elongata Johnson. One specimen determined by Hamilton. Others obtained may be the same species.

A large number of other specimens are not yet determined.

APHRODITIDÆ

Several specimens from holdfasts and from dredgings have not yet been determined.

AMPHINOMIDÆ

Erythoe californica Johnson. Under stones.

Euphrosyne aurantiaca Johnson. A number of these short yellow worms were obtained from holdfasts.

POLYNOIDÆ

Halosydna insignis Baird. A large number of these collected among mussels and under stones.

H. pulchra Johnson. Some of these found on Stichopus. A number of other specimens have been sent away for determination, including some from the sand flats of Balboa and from among hydroids.

PHYLLODOCIDÆ

Phyllodoce ferruginea Moore. Under stones at Laguna Beach.

P. medipapillata Moore. This was the largest of the family found at Laguna. Among holdfasts and in the tube masses of *Sabellaria californica* Fewk.

A number of other species remain to be determined.

NEREIDÆ

Nereis agassizi Ehl. Very common along shore and in holdfasts.

N. vexillosa Grube. A few of these were determined.

N. procera Ehl. Some of these found with the others of the family.

N. virens Sars. A few specimens, smaller specimens than those reported by Hamilton some years ago.

A number of other species will probably be added from the undetermined material.

NEPHTHYDIDÆ

Nephtys caeca Fab. Low tide, Laguna Beach. One specimen.

LEODICIDÆ

Marphysa californica Moore. A large and a smaller specimen dredged just off shore.

M. stylobranchiata Moore. Collected on the sand flats, Balboa.

Dioparta californica Moore. Dredged off shore at Laguna Beach. Also found on the mud flats at Balboa. The tube of the dredged form is of shell fragments, that from Balboa is made of sand and sticks.

Several other species of the family were collected.

LUMBRINERIDÆ

Lumbrineris erecta Moore. Holdfasts, eel grass. Among the tubes of *Sabellaria californica*.

Aracoda semimaculata Moore. Among mussels.

A number of undetermined forms may belong to this family.

GLYCERIDÆ

Glycera rugosa Johnson. Low tide.

Glycera nana Johnson. Quite a large specimen found at low tide.

ARICIIDÆ

Naiareis longa Moore. Found at low tide.

N. robusta Moore. Found at low tide.

Scolopus elongata Johnson. Balboa sand.

Several others not yet determined.

CIRRATULIDÆ

Cerratulus luxuriosus Moore. Low tide. Bright red.

C. spirobranchus Moore. Eel grass roots.

TEREBELLIDÆ

Terebella californica Moore. This seems to be the most abundant of the family at Laguna. In eel grass roots. Red gills, yellow fillaments.

Amphitrite spiralis Johnson. Red-brown, body lighter. Low tide. Laguna.

CAPITELLIDÆ

Specimens which seemed to belong to this family were found at Balboa.

CHLORHÆMIDÆ

Trophonia inflata Tred. Under stones.

OPHELLIDÆ

Ophelina magna Tred. Mostly dredged. Possibly a young of this was collected at Balboa.

O. mucronata Tred. Dredged.

AMPHICTENIDÆ

Pectinaria brevicoma Johnson. Dredged in 10 fathoms off shore. A small but perfect specimen seems to differ from Johnson's descriptions slightly. A number of perfect tubes were obtained.

MALDANIDÆ

Clymenella rubrocincta Johnson. These were abundant on the mud flats exposed at low tide, both at Balboa Bay and Anaheim Landing. Hamilton reported them from eel grass roots near Laguna. I have found some in similar places.

AMMOCHARIDÆ

Ammochares occidentalis Johnson. Several specimens were found among the roots of eel grass at Laguna last Summer. The tube of one specimen at least was made of overlapping but regular fragments of shell. Another specimen was dredged with a similar regular tube of shell fragments.

SABELLIDÆ

A number of species were collected, but none as yet determined. *Sabella elegans* Bush seems to be in the collection. Most specimens were taken from holdfasts or dredged off shore. One was found in the neighborhood of a sabellarian worm colony and some were under rock ledges.

SERPULIDÆ

But few of these were collected.

Serpula colombiana Johnson was the only one determined.

HERMELLIDÆ

Sabellaria californica Fewkes. Enormous colonies of this species are found along the shores in many places.

S. cementarium Moore. This species is usually found farther out and although common is usually found in much smaller numbers in more isolated tubes.

In the lakes back from Laguna Beach and in the streams, a leech is very common. Specimens sent to the U. S. Nat. Museum were determined as *Erpsodella punctata* Leidy. W. A. H.

(Contribution from the Zoological Department of Pomona College.)

Some Chitons Collected During the Summer of 1917

A number of specimens were sent to Dr. S. S. Berry and determined as follows:

Leptochiton cf. *rugatus* Cpr. Small white. Dredged 10 fathoms.

Callistochiton palmulatus Cpr. Dredged 10 fathoms. Ends ribbed.

Callistochiton cf. *decoratus* Cpr. Flat margins of valves rough. 1.15 by 9 mm.
Low tide.

Mophalia juv. cf. *acuta* Cpr. Broad margins, speckled brown irregular spots.
Dredged 10 fathoms.

M. mucosa Gould. Low tide.

Ishnochiton (*Lepidozona*) *clathratus* Rve. Dredged and low tide.

I. (Stenoplax) conspicuus Cpr. Large species, low tide.

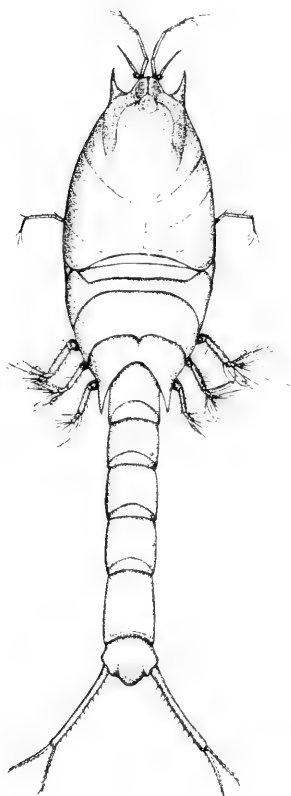
Cyanoplax hartwegii Cpr. Common flat circular form. Low tide.

Nuttallina cf. *fluxa* Cpr. Low tide.

(Contribution from the Zoological Department of Pomona College.)

A Cumacean from Laguna Beach

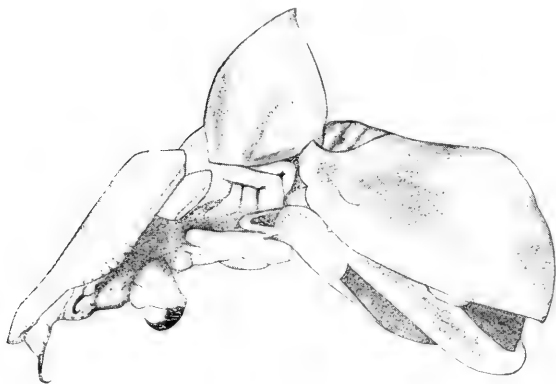
H. H. NININGER



Specimens of a little red-lined cumacean were collected by dredging in about fifteen fathoms of water just off shore, especially near Emerald Bay. These were determined by the U. S. Nat. Museum to be *Colurostylis occidentalis* Calman.

A Parasitic Copepod Found at Laguna Beach

A. M. BEAN AND HARRY STAPLES



Parasitic Isopod

Prof. A. M. Bean obtained the copepod shown in side view, enlarged four times, from the gills of *Mola mola*. The specimen was determined by the U. S. Nat. Mus. at Washington, to be *Cecrops lateillii* Wilson. The drawing is by Harry Staples.

Notes on the Central Nervous Systems of Holothurians

WILLIAM A. HILTON

A number of attempts were made to stain the central nervous system of *Stichopus* with methylene blue, but without success. Dissections were most successfully made when the animals were fixed in hot mercuric chloride. Specimens injected were filled with the fluid and the whole body was later immersed. Specimens with the body distended were obtained in this way and the nerve trunks were easily followed after the removal of the longitudinal muscle bands. Parts of the nerve trunks were removed and sectioned.

Specimens of *Leptosynapta* were imbedded and sectioned whole and a few young of *Stichopus* were sectioned whole.

Very little difference was noted between radial and circumoral nerves at different places. The general character of the nervous system was very much as found in other echinoderms. The deep nerve bands were not well marked in many of the sections, but groups of cells more or less joined with the superficial trunks were found without difficulty.

In adult *Stichopus* the cells are fairly numerous out in the fibrous area of the superficial band. The radial nerves show a bilateral division as there is often a depression on the inner side which approaches the appearance of a cavity.

In my preparations the cell body is not very distinct from the nucleus. There may be six or more layers of cells at the edge of the outer band. The nerve processes consist of many fine strands running in through the fibrous area, but there seems to be in addition to this a groundwork of material which may in large part be made of fibers and fibrils whose identity could not be discovered.

In the younger specimens of *Stichopus* the fibers were more prominent and the cells in the fibrous area were markedly fewer in numbers. The fibers for the most part seem to run the long way of the nerve trunk. Especially were long strands found in the circumoral ring, although fibers could be seen crossing in considerable numbers as well. In the radial nerves the crossing and interweaving of the nerve fibers as they show in cross section is very intricate.

Small nerve trunks were followed along the tubes of the water vascular system. These were seen to have a similar but simpler structure than the radial nerves.

In *Leptosynapta* a very similar sort of nervous system was found, but the nerve cells were larger and on the whole fewer in number. The deep nerve trunks were but poorly represented.

The fibers from the basal cells show very clearly both in the superficial and the deep nerves and the fibers cross in a complex manner at all levels. There are but few cells scattered in the fibrous area and there is apparently but little ground substance. The fibers stand out more clearly than in *Stichopus*. Possibly more fibers from the outer margin cross near the inner. This may be due to the branching at the ends of the fibers.

Fibers and fibrils are all about the same size in *Stichopus* and *Leptosynapta*. The circumoral nerve ring seems thicker than the radial, but this may in part be due to contraction. The fibers in the circumoral ring seem smaller than in the radial. In all parts there are many crossings of fibers in the fibrous portions at all angles.

Small cells at the bases of tentacles are similar to the radial nerves in structure, but with fewer more flattened cells.

Baudelot, E.

REFERENCES

Etudes generales sur le systeme nerveux contrib. a l' hist. du syst. nerv. des Echinoderms. Arch. zool. exp. vol. i.

Delage et Herouard

Traite de zoologie concrete. Vol. 3, Les Echinodermes.

Hamann, O.

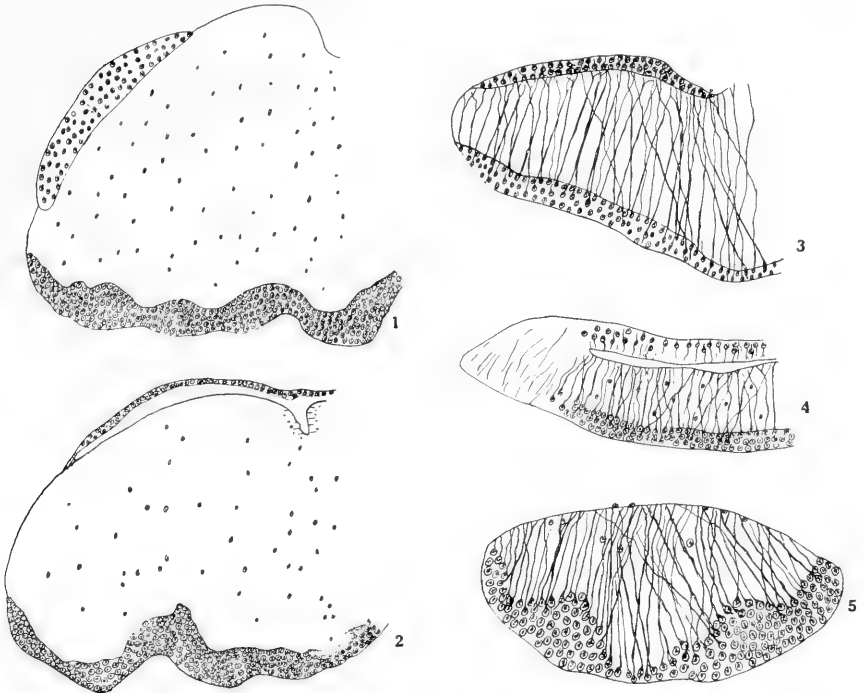
1883

Beitrage zur Histologie der Echinodermen. I Die Holothurien. Zeit. Wiss Zool. vol. 39.

Krohn, A.

1841

Neber die anordnung des Nervensystems der Echiniden und Holothurien im Allgemeinen. Muller Arch. Anat.



Central Nervous System Holothurians

Fig. 1 and 2. Drawings of cross sections of the radial nerve of Stichopus. A little more than one-half of the section is shown. The smaller deep strand is shown on the upper side. X 350.

Fig. 3 and 4. Sections through the radial nerves of a young Stichopus. About one-half of the radial nerves are shown in cross section. X 350.

Fig. 5. Cross section of the radial nerve trunk of Leptosynapta. X 350.

(Contribution from the Zoological Department of Pomona College.)

Notes on Flat Worms at Laguna Beach

W. L. GROW, DARSIE L. DARSIE

We have not had any of these determined as yet. We should be glad to collect specimens for anyone who would determine them for us.

One or two kinds of tricladids are found under stones. Most of these are brown or gray, some are pink and some almost red.

At least one species of polycladid is found commonly under stones. They are nearly circular in outline and may possibly belong to the genus *Leptoplana*.

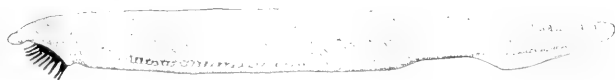
Another species nearly circular in outline was collected by Mr. Grow in 1916. Others were collected in 1917. They were black with narrow longitudinal red lines.

A large grey species was collected by Mr. Darsie in 1917. Two were obtained in a tide pool near Boat Cañon. They swam by means of rapid undulating movements of the frilled edges of the body.

(Contribution from the Zoological Department of Pomona College.)

BRANCHIOSTOMA CALIFORNIENSE GILL

Specimens of Branchiostoma have been dredged at Laguna Beach for the past three years. Prof. A. M. Bean first brought them in from just beyond the Laboratory in from 10 to 15 fathoms of water. Almost every haul near this place in the coarse



rough sand and shell debris which is abundant there. The drawing is by Charlotte Johnson.

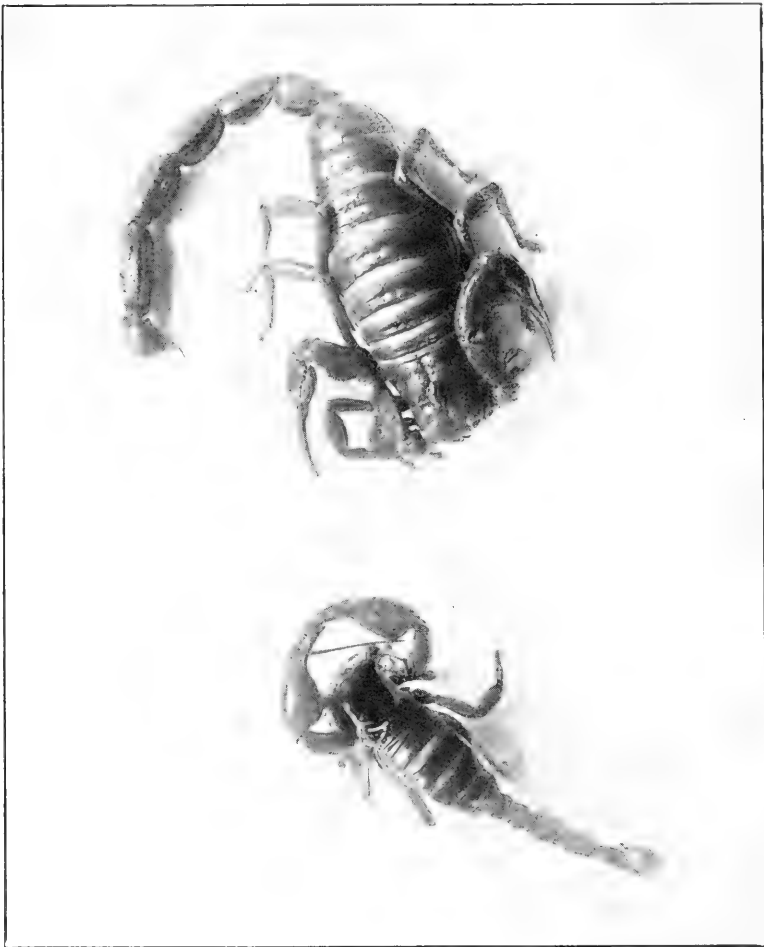
Further Observations on the Mountain Sheep of the San Gabriel Range

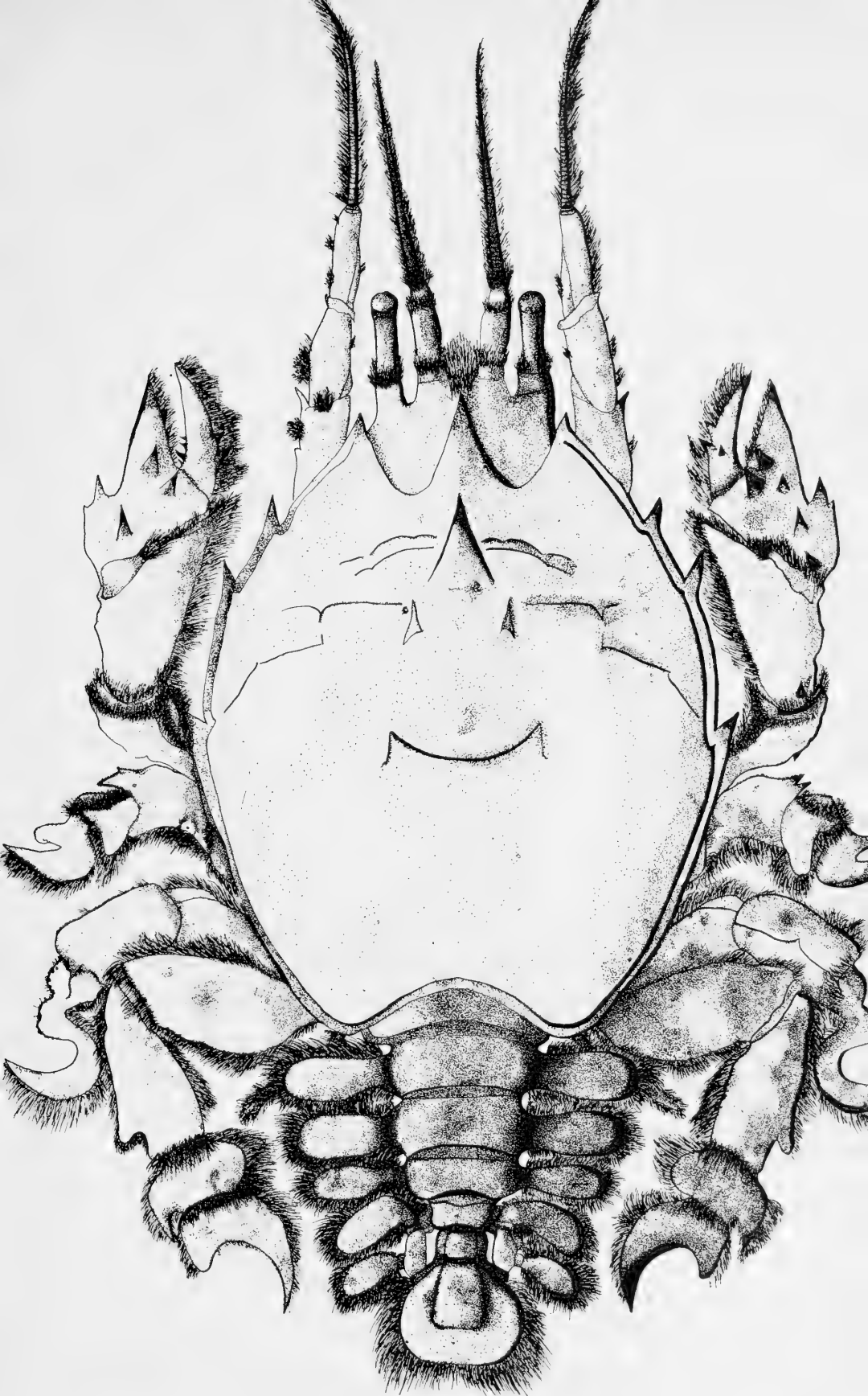
WILLIAM A. HILTON

On the 15th of December, 1917, I had the good fortune to come upon quite a number of the mountain sheep which range over some of the highest and roughest elevations of these mountains. Occasionally one or several sheep have been seen by those who have been climbing over Ontario, Cucamonga or Telegraph peaks. As a rule the animals are very shy and give nothing more than a glimpse. The exact identity of these animals and their total number remains unknown. It has been suggested that they are *Ovis canadensis nelsoni* C. H. M. These that I saw are much like the specimens in the college museum which were collected in Lower California, but the horns of the male seemed more massive in the San Gabriel specimens so far as I could keep the size and proportions in mind. Just how many Mountain sheep there are in this range we have no clear way of telling. I believe that the rather large band which I saw is not all of them. Those seen by me on December 15th were within a hundred feet from the top of the ridge of Ontario peak. They were in the dense forest which grows near the top of the mountain on the San Antonio cañon side. As we ascended the trail we came in sight of seven or eight adult animals partly hidden among the bushes. They were not farther than one hundred and fifty feet away and did not at first see us or take alarm, so it was possible to watch them for some time. When a large ram caught sight of us he suddenly stopped walking about and eyed our every movement, then when we came a little nearer the whole band ran to the top of the ridge and it was possible to count them. There were twenty-four in all, at least six large rams, six females and six half grown young. The exact number of each was impossible to make out.

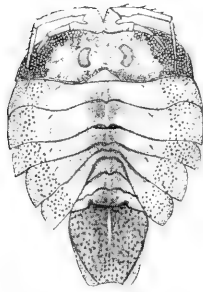
Scorpions from the Claremont-Laguna Region

The two species of scorpions which have been found in the Claremont Laguna Region are shown in the accompanying photograph by L. Cooper. The smaller, *Anuroctonus pharodactylus* Wood, is found throughout the region except in the higher mountains. The larger *Hardurus hirsutus* Wood, is more of a desert species and seems to be confined to the more desert portions of the region.





Blepharipoda occidentalis Randall.
Specimen from Laguna Beach. Drawing by J. Caldwell.



Scrolis carinata Lock. Drawing by Staples.

Notes on Sponges at Laguna Beach

W. L. GROW

During two summers Mr. Grow collected and studied sponges at Laguna Beach. We have not been able to get any of the local forms satisfactorily determined, and the notes here given are simply suggestions. We shall be glad to turn over an abundance of material to any one who wishes to work on the group.

At least three kinds of simple calcareous sponges were found under rocks and on kelp holdfasts.

Leucosolenia sp.? is found at times under rocks at low tide. The sponge is about 10 to 12 mm high and narrower at the base, white, slender, not very abundant.

At least two species of *Sycon* or *Grantia* were found under stones and on holdfasts. Those from deeper water have longer spicules.

The most conspicuous sponge at Laguna is found in masses under rock ledges. It is often quite large and irregular in outline. It is sometimes divided into many partially separate colonies and again it may occur in a smooth mass. It is pure white. Possibly it belongs to the genus *Petrostoma*. In its cavities several animals often retreat, small crabs of the genus *Pachygrapsis* and young and adults of the crab *Pachycheles rudis* Stimp. and the isopod *Cirolana harfordi* var. *spongicola* Staf.

A species of *Clathrina* occurs at Laguna Beach now and then. During some winters this stalked white, mushroom-like species is found among tufts of Bryozoa.

The so-called sulphur sponge is common under stones and rock ledges. There is no differentiation into individuals, the oscula are scattered over the surface, which may be very irregular. Great masses of these yellow sponges are often found. The only animal associated with them seems to be the limpet *Tylodina fungina* Gab.

Pink encrusting sponge. Found on shells, seaweed, etc. Pink-white, smooth, few openings evident. Calcareous spicules triaxons and monaxons. It is rather thin.

White encrusting sponge (I). White, fused at the base, but with distinct, erect individuals each with osculum. Often covered with Bryozoa. Triaxon spicules and spongin fibers present. Under ledges of rock.

White encrusting sponge (II). Soft white, but tenaceous. Peels off from shells and twigs. Has only triaxon spicules. Found on rock surfaces, seaweed, kelp holdfasts.

Red sponge. Bright red, feels spongy. Encrusts a base and sends out tufts which fuse. Triaxon spicules. Spongin fibers, rather broad cavities. On seaweeds and under rocks.

Yellow sponge. From a yellow to an ocher. Never the color or texture of the sulphur sponge. Semi-encrusting with some erect irregular portions which may fuse again with the parent mass. Parts may wind and twist among bryozoan masses. Monaxon spicules, granular structure. Surfaces of rocks, rock ledges and seaweeds.

White dermal sponge. Soft spongy, greyish white. Fibers or strands easily seen by the naked eye. Grows under ledges. Composed of spongin fibers. Some dry bits cast up on the shore seem to be of as good quality as a first class bath sponge.

Massive pink-white sponge. These are calcareous in part, pink on the surface and very dense. Channels not well marked. Large masses under rock ledges.

In addition to the above there is a very bright red sponge which is found under stones.

At Balboa bay among some oysters there is a large irregular pyramidal dermal sponge of a dark brown color.

(Contribution from the Zoological Department of Pomona College.)

The Central Nervous System of a Long-Armed Serpent Star

WILLIAM A. HILTON

The specimens were found in the sand of Balboa Bay. A specimen was determined by Dr. Clark as probably *Amphiodia barbaræ* Lyman. When obtained these creatures move their arms very vigorously. When in the sand they bury themselves very effectively. Out of the sand the arms are not moved to so good purpose, and they become tangled.

The great length of the arms and the smallness of the disc made these interesting objects for study. Sections were made of the arms close to the disc and at their tips. In the specimen from which the sketches were made, the arm sectioned was 250 mm long and the disc 10 mm in diameter. The arms do not taper much and the radial nerve is about the same size for some distance. At about one centimeter from the tip of the arm the diameter of the nerve trunk is much less to correspond to the smaller diameter of the arm. At the very tip of the arm the nerve cord is of course very much reduced, but it is larger in proportion than it was at other parts of the arm. (Contribution from the Zoological Department of Pomona College.)

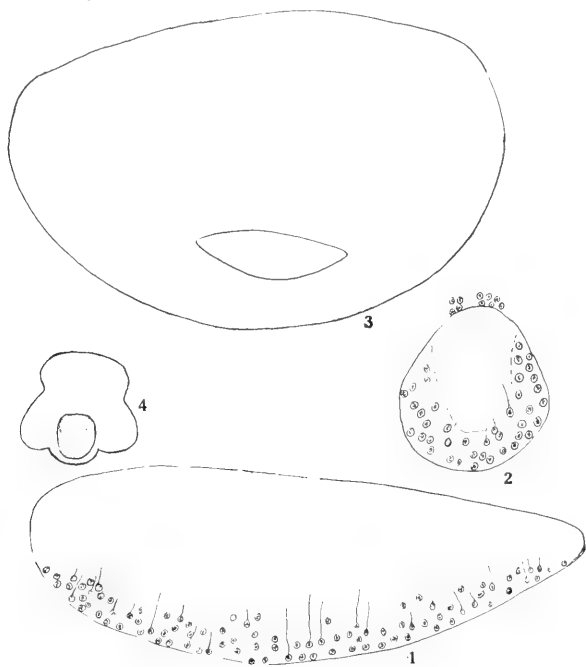


Fig. 1. Cross section of the radial nerve of *Amphiodia*, section taken near the disc. X350. Aboral side up.

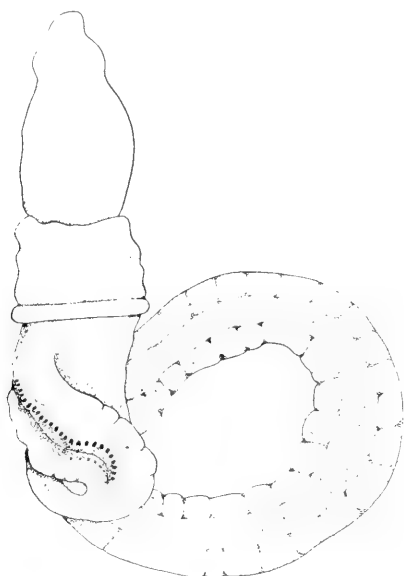
Fig. 2. Section across the radial nerve near the tip of the arm. Aboral side up. X350.

Fig. 3. and Fig. 4. Sections across the arm at the base and at the tip, showing the outline of the arm with the nerve trunk within. Aboral side up. X70.

Dolichoglossus Pusillus Ritter

WILLIAM A. HILTON

The writer first discovered the occurrence of *Dolichoglossus* in the sand flats at Balboa Bay, in August, 1917. In one little cove they were found to be very abundant. Large numbers of old burrows were evident in many places and the castings in some places gave clear indications of many animals. In certain places they were the most abundant animals. Specimens were collected once or twice a month for several months, and a large number of tubes were examined for embryos. Eggs and young of various stages were obtained at almost any time, so it seems quite possible that there is no absolute breeding season. Further observations may settle this point a little later. The sand cases or burrows are so delicate that they are easily broken,



yet the best way to collect the eggs and adults seems to fix large numbers of the animals within the cases and then later open the sand tubes and remove the specimens. In some cases the living animals were taken within the tubes and later removed at the laboratory.

Other places where *Dolichoglossus* occurred were found to be on the mud flats the other side of the bay from the first situation and in fewer numbers at Anaheim Landing. Later a few were obtained under eel grass not far from the Laboratory at Laguna Beach.

(Contribution from the Zoological Department of Pomona College)

Pycnogonids Collected During the Summer of 1917 at Laguna Beach

WILLIAM A. HILTON

During the summer no particular attention was given to the collection of these creatures, but all that were found were saved. Some places where they were known to be abundant were not searched at all. In consequence of this, the larger forms were especially obtained, especially those found under stones. There are a number of new locality records. Something over 200 specimens were collected.

Pallene californiensis Hall. One specimen Aug. 19.

Lecythorhynchus marginatus Cole. One with eggs, date? Some young, in all 38, most were found among stones, among muscles and a few in red algæ.

Ammothella tuberculata Cole. In August 8 specimens. No eggs. Sept. 1, 7 under stones. Sept. 13, 2 specimens. Sept. 16, 8 of which three had eggs. In all 25.

A. bi-unguiculata var. *californica* Hall. During July 4 specimens, one with eggs. August, 11 with eggs, 21 without. September, 15 with eggs, 13 without. In all, 64.

Ammothella spinosissima Hall. August, 2 with eggs, 16 others. September, 1 with eggs, 2 without. September 16, 3 without eggs. These last were found in among the worm cases of *Sabellaria californica*.

Ammothella spinifera Cole. Five specimens with eggs under stones during August, one specimen without eggs.

Tanystylum intermedium Cole. July, six specimens in Bryozoa. August, 17, three among alcyonarian colony. No eggs. August, 19, under stones, one with eggs, five others. September 1, 14 without eggs, one with. Stones.

T. orbiculare Wilson. One specimen with eggs under stone. August. Eight among red algæ, no eggs. September 1, 17 without eggs, four with eggs under stones.

Clotenia occidentalis Cole. One specimen with eggs and young dredged, Aug. 27. One specimen without eggs.

Anoplodactylus californicus Hall. One without eggs dredged August 27. One under a stone, August. No eggs.

Phoxichilidium femoratum Cole. Sept. 1st, one immature.

Halosoma viridentestinalis Cole. Among Bryozoa and under stones. Aug. 19, two with eggs, four others. Sept. 1, one with eggs, five others.

Eurydice spinosa Hilton. One with eggs, August 17. Locality uncertain. Four with eggs, one without, Sept. 17, 1917, from holdfast.

This species was described from a specimen collected at Laguna Beach in September, 1915. Judging from the number of specimens obtained from the holdfast, the species seems to be from deeper water.

Pycnogonum sternsi Ives. Sept. 2, four young under stones. Sept. 3, one young.

Nymphon sp.? Sept. 1, one species of what apparently belongs to this genus was found, a single specimen well inshore.

Species living among colonies of *Sabellaria californica* were:

Ammothella bi-unguiculata var. *californica* Hall. *A. spinosissima* Hall.

Deep water forms seem to be: *C. occidentalis*, *A. californicus* and *E. spinosa*.

(Contribution from the Zoological Department of Pomona College)

Some Echinoderms of Laguna Beach

In the summer of 1915, Prof. A. M. Bean dredged an injured specimen of heart urchin. It seems to be the same as the one labeled *Lovenia cordiformis* Gray, in the museum of the Scripps Institution at La Jolla.

Since 1915 we have dredged large numbers of the little urchin, *Lytechinus anamesus* H. L. C., Det. H. L. C.

The sand dollar *Dendraster excentricus* Esch. has been dredged every summer, especially off Emerald Bay. It is also very common in places on the mud flats at Balboa and Anaheim Landing.

The starfish *Ludia foliata* Grub. has been obtained but once. The starfish *Henricia letinscula* Fisher Det. H. L. C., whose central parts were yellow and whose arms had purple tips, has been collected but once, by Mr. Grow in 1916.

But one specimen of the basket star has been taken. It was determined for us by Dr. H. L. Clark. It is *Gorgonocephalus eucnemis* M. & T.

The following serpent stars have been found every summer at low tide: *Ophioderma panamensis*. Lutk. Det. H.L.C. is the largest species. *Ophioplocus esmarki* Lyman, Det. H.L.C. Usually unicolored. *Ophionereis annulata* Le Conte. Compared with Fisher's determined specimens. *Ophiothrix spiculata* Le Conte. This variable and beautiful form is found in many places, among mussel beds, in holdfasts and dredged.

Ophiocryptus maculosus Clark. Det. H. L. Clark. These have been collected from holdfasts.

During the summer of 1917 a curious long-armed serpent star was collected. It was determined for us by Dr. H. L. Clark, but as the disc fell off the determination is not quite sure. "I am cataloging it as *Amphiodia barbaræ* Lyman, known only from Santa Barbara. But the arms of this specimen are much longer than the typical *barbaræ*, so it may be *urtica*. One must have the disc to be sure."

We hope to collect more specimens of this another summer. The holothurians so far are as follows:

The common *Stichopus californicus* Stimp. and the large red dredged *S. johnsoni* Heel.

Several specimens of a brown *Thyone* have been obtained. Several red with black tentacles which Dr. Clark thinks may belong to the genus *Cucumaria*. Another specimen sent in 1917 to Dr. Clark, "It is apparently *Cucumaria curota* Cowles."

In 1914 a single specimen of *Psolus* Sp. was obtained.

White and pink specimens Dr. Clark has determined as *Leptosynapta inhaerens* O.F.M.

(Contribution from the Zoological Department of Pomona College)

A List of Odonata Chiefly from Laguna Beach

DARSIE L. DARSIE

The determinations were made for us by Dr. Munz.

DRAGON FLIES

Libellula saturata Uhl. Sub. Sp. *croceipennis* Selys. Found at Laguna and Claremont. Common large form with red-brown body and basal two-thirds of wings red-brown.

Plathemis lydia Durury. Large. Wings banded near body and near center. Female has slighter bands. Common Claremont and Laguna.

Sympetrum illotum Hagen. Medium size. Tinge of brown on clear wings, dark brown body in dry specimen. Laguna Beach.

S. corruptum Hagen. Medium size. Clear wings, light body. Common Claremont and Laguna.

Aeshna multicolor Hagen. Large. Clear wings, colored body. Laguna.

Erythemis simplicicollis Say. S. sp. *collocata* Hagen. Medium size. Clear wings, blue body. Laguna Beach.

Tramea lacerata Hagen. Chocolate brown marks at base of hind wings. Laguna Beach.

Anax walsinghami MacLachlan. Clear wings. Very large. Our largest species. Laguna Beach.

DAMSEL FLIES

Heterina americana Fab. Base of wings bright red. Claremont and Laguna.

Argia virida Hagen. Male blue body. Clear wings. Claremont and Laguna.

Emallagma cyathigerum? Carpentier.

Calaenura denticollis Burmeister. Very small. Claremont.

Amphiagrion saucium Bur. Red body. Very small.

(Contribution from the Zoological Department of Pomona College)

A List of Small Mammals from the Claremont-Laguna Region

HALSTEAD C. WHITE

The mammals were all but several bats collected by H. G. White. All determinations are by the Museum of Vertebrate Zoology of the University of California.

Myotis evotis Allen. Long-eared bat. Claremont.

Nycteris borealis teliotis Allen. Western Red Bat. Claremont.

Scapanus latimanus occultus Grinnell and Swarth. Southern California mole. Claremont and Webber's camp, San Gabriel Canyon.

Reithrodontomys megalotis longicauda Baird. Long-tailed Harvest Mouse. Glen Ranch. Santa Ana River.

Peromyscus maniculatus gambeli Baird. Gambel White-footed Mouse. Santa Ana River. Pomona Hills.

P. californicus insignis Rhoads. Southern Parasitic Mouse. Glen Ranch. Claremont. Laguna Beach.

P. eremicus fraterculus Miller. Dulzura white-footed mouse. Claremont. Laguna Beach.

Neotoma fuscipes macrotis Thomas. Long-eared Wood Rat. Laguna Beach.

N. intermedia intermedia Rhoads. Intermediate Wood-rat.

Microtus californicus californicus Peale. California Meadow Mouse. Coble's canon. Santa Ana River, near Corona.

Mus musculus Lin. At Laguna Beach, not far from houses.

Perognathus californicus femoralis Allen. Dulzura Pocket Mouse. Glen Ranch. Laguna Beach.

Tomomys bottae pallescens Rhoads. San Diego Pocket Gopher. Glen Ranch.

(Contribution from the Zoological Department of Pomona College)

SMITHSONIAN INSTITUTION LIBRARIES



3 9088 01054 7537